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The HORN Expedition (1894) to Central Australia: New Directions in Australian Herpetology

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Abstract. The 1894 HORN Expedition to Central Australia was pivotal to the development of Australian herpetology, both in turning interests to the central Australian fauna, and in emphasising the importance of field observations of habitat, behaviour, life colouration, reproduction, and tadpole morphology. Brief biographies of the biological collector, Walter Baldwin SPENCER, the two authors of the reptile account in the expedition report, Arthur LUCAS and Charles FROST, and of Joseph FLETCHER, who was closely associated with all three, are provided. All had herpetological research interests (although the subsequent careers of three diverged from this path), and the interactions between the four were vital to the development of their herpetological careers, and to the success of the HORN Expedition itself. The current status of the herpetological collections made by the HORN Expedition is summarised, and modern reidentifications of the species covered in the expedition report are provided.

Key words. Herpetology, history, Australia, Joseph FLETCHER, Baldwin SPENCER, Arthur LUCAS, Charles FROST.

1. INTRODUCTION

Herpetology as a biological science has usually been seen to be the poor cousin of other branches dealing with vertebrates (STRAHAN 1985). Although knowledge of the Australian bird and mammal fauna was well advanced by the middle of the nineteenth century, herpetological knowledge was severely limited by access to much of the continent, the availability of material, and vast differences in relative interest in obtaining different groups of organisms. An understanding of the history of Australian herpetology has similarly lagged. While there have been whole volumes devoted to the history and bibliography of Australian ornithology (WHITTELL 1954) and entomology (MUSGRAVE 1932), and great attention has been paid to manuscript fragments of field notes regarding Australian mammals (e.g., CALABY 1966; WHITTELL & CALABY 1954) (some of this due to the sorry history of extinction of the Australian bird and mammal fauna), the history of Australian herpetology has largely been limited to more comprehensive, though less detailed, studies (e.g., WHITLEY 1970, 1975; FINNEY 1984).

In the fifty-six years between the first published descriptions of Australian reptiles and amphibians (in WHITE 1790) and the publication of GRAY's (1845) catalogue of British Museum lizards, some 209 names currently representing about 136 species had been proposed for herpetological specimens from Australia (COGGER et al. 1983). All were described by systematists based in Europe from material sent from Australia, and most were known only from coastal localities (Fig. 1). Exploration of the interior of the continent was constrained by long distances, limitations of animal transport and the dry, hot climate, with an emphasis on traversing the continent as fast as possible and on personal survival. As a result, collections of preserved reptiles and amphibians were mostly restricted to sea-based European expeditions and the limits of settlement.

The second half of the nineteenth century saw the first Australian-based herpetological systematists, with publications by Gerard KREFFT and William John MACLEAY in Sydney, Frederick MCCOY in Melbourne, and Charles Walter DE VIS in Brisbane. However, despite all four being locally-based, and in the case of KREFFT, with some field experience (KREFFT 1863, 1866a,b), there was still a bias towards collections from settled or sea-accessible areas (Fig. 2).

The last decade of the nineteenth century, with KREFFT, MACLEAY and MCCOY gone or having ceased herpetological publication, and DE VIS' output in decline, finally saw the first herpetological studies of the deserts of central Australia, initially by the ELDER Expedition of 1891–92, and then by the HORN Expedition of 1894, together with a new generation of herpetologists in Australia. Although the multi-volume Report of the HORN Expedition is well-known, its importance in Australian science the subject of a recent volume (MORTON & MULVANEY 1996), and extensive biographical details are available on its biologist and editor, Walter Baldwin SPENCER (MULVANEY & CALABY 1985), the pivotal role of this Expedition and its Report on the development of Australian herpetology have not previously been explored. Further and conversely, the vital role of herpetology in the development of the careers of SPENCER and the authors of the chapter on reptile collections from the expedition, Arthur LUCAS and Charles FROST, with which a fourth herpetological fig-

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Fig. 1: Type localities of Australian reptiles and amphibians described between 1790 and 1845.

ure, Joseph FLETCHER, is inextricably linked, has not been previously identified.

This paper attempts to document these aspects of Australian herpetological history, and also provides documentation of the extant herpetological collections made on the HORN Expedition, updating the identifications provided in the HORN Expedition Report.

2. FOUR HERPETOLOGISTS

2.1. Joseph James FLETCHER (1850–15.v.1926)

Although FLETCHER was not directly associated in print with the HORN Expedition, he was an important catalyst, involved in turning LUCAS' thoughts to amphibians and reptiles and to field observations, and SPENCER's thoughts to amphibian systematics and biogeography. Much of the detail of FLETCHER's life is provided in obituaries by SPENCER (1927, including a photograph) and FERGUSON (1927), a list of his publications (ANONYMOUS 1929), and a subsequent memoir by LUCAS (1930) (see also WALSH 1981 for a summary and additional shorter obituaries).

FLETCHER was born in Auckland, the son of a Methodist minister, Joseph Horner FLETCHER, and arrived in Australia in 1860. His father was initially sent to Brisbane and Ipswich, then in 1865 became President of Newington College, a recently-established Methodist school in Sydney (MACMILLAN 1963). Joseph Horner had some experience in this area, having previously established a Methodist college at Auckland. His son, Joseph James, was educated at Ipswich Grammar, Newington, then at the University of Sydney, obtaining a

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Fig. 2: Type localities of Australian reptiles and amphibians described between 1846 and 1890.

B.A. in 1870. On graduation, he taught at Wesley College in Melbourne, simultaneously reading for an M.A., before departing for London in 1876 on receipt of his second degree.

In London, he worked in Thomas HUXLEY's laboratory, and gained a second Bachelor's degree, a B.Sc. from the University of London, as Australian universities did not offer Science degrees at the time. During this period, he was invited to spend three months at Cambridge, working on embryology with Francis Maitland BALFOUR, where he met the biologist Arthur Milnes MARSHALL.

While in England, he published a single paper, co-authored with Joseph Jackson LISTER, on marsupial genital anatomy (LISTER & FLETCHER 1882), and began to compile a bibliography on Australian marsupials and monotremes.

On returning to Australia, he taught at Newington (still under his father's presidency) from 1881–1885, during which period he was acting headmaster for a short period in 1883/84. While teaching, he continued his research on marsupial anatomy (FLETCHER 1882, 1883a, 1883b), and completed his bibliography (FLETCHER 1884). In 1885, he was offered an administrative position as Director and Librarian of the Linnean Society of New South Wales by the Society's founder and benefactor, William John MACLEAY, and left teaching, beginning his new career in 1886. He remained with the Linnean Society of New South Wales until 1919, although his title later changed to Secretary. During this period,

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he also edited the Society's publications. Even after retirement, he was unable to leave the service of the Society, being elected President in 1919–20 and 1920–21, and Vice-President after that.

Although FLETCHER's early work (1881–1885) was on marsupials, he published a single herpetological paper at this time, reporting viviparity in a lizard (FLETCHER 1883c; the species involved, identified as *Hinulia elegans* in the paper (presumably *H. elegans* Gray, 1838), is probably *Eulamprus heatwolei* (Wells & Wellington, 1984), based on reported size of the female and the fauna present at Burrawang, the locality cited). Between 1886 and 1898, he changed research direction. Extensive fieldwork experience in the Sydney area and surrounding ranges led him to work on earthworm, terrestrial planarian and onychophoran systematics, and amphibian biology. His first paper in amphibian biology (FLETCHER 1889) dealt with reproductive ecology and habitat preferences of the local Sydney frog fauna, and was a major improvement on the only previous paper on this topic (KREFFT 1863[1]). However, he soon developed an interest in determining the distribution of Australian frogs. Previous European workers describing Australian species had been content with broad locality descriptions, such as New South Wales, or even Australia. FLETCHER, his interest kindled by his local experiences of discrete habitat preferences, began to accumulate frog collections from around Australia, developing an extensive network of informants and collectors. This led to a series of five papers (FLETCHER 1891a,c, 1892, 1894a, 1898) on the distribution of Australian frogs, and in turn to some thoughts on distribution patterns and broad faunal elements. Inevitably, some specimens obtained represented new species. At first uncertain of the status of these taxa, he sent material to George BOULENGER at the British Museum, who described them (BOULENGER 1888, 1890, 1893, including the patronyms *Limnodynastes fletcheri* Boulenger, 1888 and *Lechriodus fletcheri* (Boulenger, 1890)), but later began to describe new species and varieties himself (FLETCHER 1891b, 1894b, 1894c, 1898). FLETCHER later shifted direction again, working almost exclusively on botany, particularly on *Acacia*, *Grevillea* and eucalypts, after 1909.

2.2. Arthur Henry Shakespeare LUCAS (7.v.1853–10.vi.1936)

Knowledge of Arthur LUCAS' life is extensive. He wrote an autobiography (LUCAS 1937) and was the subject of two extended obituaries (CARTER 1937a,b), as well as several shorter accounts (DONOVAN 1938; DUCKER 1986, 1998). The autobiography and the longer of CARTER'S obituaries carry the same photograph of LUCAS in old age. A line drawing of a younger LUCAS is presented by ANONYMOUS (1899b) and a photograph of unknown age by DUCKER (1998).

Arthur LUCAS was born at Stratford-on-Avon in England, son of a Methodist minister. After a succession of schools for his early education (a legacy of his father's profession), he entered the New Kingswood School at Bath in 1862, run by the Methodists. His early life, with an ever-changing background, instilled in him an interest in natural history, particularly in geology and palaeontology. Similar interests developed in his older brother Thomas, who became interested in entomology and ornithology. LUCAS was awarded a Conference Scholarship (given to the head boy of the previous year) and spent an extra year at Kingswood, followed by six months as a pupil teacher, and won an exhibition to Balliol College, Oxford.

LUCAS went to Balliol in October 1870, and read for final Honours in Mathematics and Natural Sciences, with a view to studying medicine like his older brother. Stricken by a severe bout of pneumonia and pericarditis immediately prior to the examinations, he was given a special examination which allowed him to graduate with fourth class Honours in Mathematics. His Oxford period ended with winning the Burdett-Coutts Prize, an open University prize.

After beginning a medical apprenticeship with Thomas in London, Arthur began to study medicine at London Hospital, to which he gained an Entrance Science Scholarship. In his first year of study, he won the Gold Medal of the Apothecaries' Society in Botany, but was soon forced to give up his studies to support his brother's family when Thomas became ill. Thomas emigrated to Australia, leaving Arthur to support the children (LUCAS 1937: 103, 127, *contra* DUCKER 1998). In order to earn a living, Arthur began a teaching career, initially teaching mathematics and science at the Leys School, Cambridge. His interests in science education became apparent at this time, when he formed a school natural history society, an activity repeated later (see below). Among his students at The Leys was William S. DAY (LUCAS 1937: 111–112), later to become a significant collector of tropical Australian fauna (including

1 It is possibly KREFFT's (1863) comment, dealing with the disappearance of *Litoria citropa* (DUMÉRIL & BIBRON, 1841) in summer ("I believe [it] frequents the high branches of the *Eucalypti* during the summer"), that led to a subsequent statement by MCCOY (1867) ("The Batrachia, ... are rarely seen or heard, – the true tree-frogs (*Hyla*) inhabiting the lofty gum-trees...") that in turn particularly aroused FLETCHER's ire, as he is twice attributed (SPENCER, 1927; see also LUCAS, 1930) as repeatedly quoting "a sentence penned and published in an unlucky moment by a well known Professor of Natural Science who had never worked in the field, 'In Australia the Hylas inhabit the tops of the lofty gum trees'". If this is true, this judgement is too harsh – KREFFT was certainly familiar with the local fauna under field conditions, even if MCCOY misinterpreted KREFFT's surmise as fact.

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type material of the frog *Nyctimystes dayi* (Günther, 1897) and the gecko *Phyllurus lichenosus* Günther, 1897, a synonym of *Saltuarius cornutus* (Ogilby, 1892)). While in Cambridge, he worked at various university laboratories and museums, becoming associated with the biologist Arthur Milnes MARSHALL. Field research on the Isle of Wight and in the Channel Islands led to a Fellowship of the Geological Society.

In 1883, LUCAS followed his brother to Australia, where he became mathematics and science master at Wesley College in Melbourne, establishing another school natural history society. His interest in fieldwork continued, and within 12 months of arriving in Melbourne, he was collecting in southern Tasmania. In 1885, he joined J.B. GREGORY on an overland trek to Wilson's Promontory, collected giant earthworms with SPENCER in September 1887, and in 1890 joined an expedition to east Gippsland with Arthur DENDY and William HOWITT (HOWITT et al. 1891). He also collected around the Yarra Falls and Mt Baw Baw (LUCAS 1937: 152). With this interest in field studies, he soon became a member of the Field Naturalists' Club of Victoria (his brother had been one of the founders three years earlier) and was instrumental in initiating the Club's publication, the Victorian Naturalist, of which he was editor from the first issue (1884) to 1892. He was also elected to membership of the Royal Society of Victoria in 1885 (later issues of the Proceedings of the Royal Society of Victoria give his year of membership as 1895, in error).

Continuing his interest in science education, LUCAS took an *ad eundem* degree, which entitled him to sit on the Melbourne University Senate, from where he lobbied to improve science teaching facilities, to include science subjects in the matriculation requirements, and to establish a Chair in Biology. This latter was successful, leading to the appointment of Baldwin SPENCER (although LUCAS had also been one of the applicants for the chair; MULVANEY & CALABY 1985: 96).

LUCAS had a heavy workload during his years in Melbourne. In addition to his teaching duties at Wesley College, his administrative duties with the Field Naturalists' Club and the Royal Society, and his efforts on the University Senate, he also began tutoring at Ormond and Trinity Colleges of Melbourne University in 1885, and pushed for the establishment of the Methodist Queen's College. He later become one of its Senior Fellows, as well as tutoring in science there. His promotion of science also extended to lobbying the Government for the creation of a nature reserve on Wilson's Promontory (DUCKER 1998), and a Port Phillip Biological Survey. In both of these activities, he was successful in prodding the government to establish committees to look further at the proposals. Little wonder that LUCAS (1937: 151–152) described his daily activities during this period as: "leaving home at eight in the morning and returning at eleven at night", and that he rejected the additional offer from SPENCER of a lectureship in biology at the University.

In December 1892 LUCAS left Melbourne to become headmaster of Newington College, where he also taught English, mathematics and science (chemistry and geology), and initiated yet another Science Club, together with a zoo (MACMILLAN 1963). Almost immediately, he joined the Linnean Society of New South Wales, becoming a member of council in 1895 (he was president from 1907 to 1909, and vice-president from 1909 to 1916). In 1899, he left Newington to become senior mathematics and science master at Sydney Grammar School, where he stayed for 25 years, eventually becoming headmaster. He also presented geology lectures at the University of Sydney.

During the school vacations, he continued with fieldwork, both in the Sydney region (with FLETCHER and the geologist T.W. Edgeworth DAVID), as well as commencing some botanical research at the University of Sydney on a genus of conifers. In the hiatus between his two Sydney schools, he participated in a botanical expedition to Mt Kosciusko (with FLETCHER), during which he became temporarily separated from the main party, leading to illustrated headline stories in the Sydney press (ANONYMOUS 1899a, 1899b).

LUCAS finally retired from Sydney Grammar in 1923, at the age of 70, but accepted the offer of the Chair of Mathematics at the University of Tasmania, finally retiring from teaching at the end of 1925, to return to Sydney.

In his later years at Sydney Grammar, LUCAS developed an interest in marine algae (DUCKER 1998), and this interest flowered following his retirement, with over 20 papers on the group published between 1909 and 1935. This interest led to collecting expeditions to South Australia, Victoria, Tasmania, Queensland and Western Australia, including a month on the Low Islands in Queensland in 1931 (aged 78) and, two years later, fieldwork on Lord Howe Island. His final scientific publications were the two volumes on the Seaweeds of South Australia (LUCAS 1936; LUCAS & PERRIN 1947) the second volume of which was incomplete on his death, and completed by Florence PERRIN many years afterwards.

In addition to his skills in mathematics and biology, LUCAS was also multilingual. On top of the traditional formal schooling in Latin and classical Greek of the time, LUCAS was also fluent in French, German, Italian, Russian and Spanish. CARTER (1937b) suggested that he used to spend his summer vacations learning new languages in addition to fieldwork, and there are reports

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(CARTER 1937a; MACMILLAN 1963) that he learnt Russian to read a paper on mating behaviour in lizards (although the identity of the paper has not been identified, and DONOVAN (1938) and DUCKER (1986) more generally stated that the relevant material was a book on "lizards").

In keeping with his active life, LUCAS died while travelling from Melbourne to Sydney, due to pneumonia contracted while collecting seaweeds at Warrnambool.

LUCAS' name is perpetuated in herpetology by the generic name *Lucasium* Wermuth, 1965, and by the species name *Diplodactylus lucasi* Fry, 1914, the latter a junior synonym (APLIN & ADAMS 1998) of *Diplodactylus pulcher* (Steindachner, 1870).

At the time of his arrival in Australia, LUCAS had published only a single paper, on geology. Although he soon published several minor notes on a variety of topics in the Victorian Naturalist, his publications did not follow any one theme until he began to write on herpetological subjects. This research direction dominated his publications for the next decade and a half (FROST & LUCAS 1894; LUCAS 1890, 1892, 1897, 1898; LUCAS & FROST 1894, 1895a, 1895b, 1896a, 1896b, 1896c, 1897, 1900, 1901, 1902, 1903), either singly or in collaboration with Charles FROST, although this phase ended abruptly, with only two subsequent non-technical publications dealing with herpetology (LUCAS 1914; LUCAS & LE SOUEF 1909). LUCAS' first specifically herpetological work, on the distribution of Victorian frogs (LUCAS 1892) was clearly influenced by FLETCHER'S work on the distribution and biology of frogs in New South Wales (LUCAS 1930: 744). The relationship between the two also extends to parallels in their careers. Both FLETCHER and LUCAS taught at Wesley College and Newington College[2], although FLETCHER preceded LUCAS. The similarity surely relates to religion, with both being the sons of Methodist ministers, and both schools run by the Methodist Church. Undoubtedly, this common background facilitated their friendship. On LUCAS' transfer to Sydney in January 1893, he rapidly became a close friend of FLETCHER, who introduced him to the Linnean Society of New South Wales. LUCAS became a member in May 1893, reading his first paper only two months later (FROST & LUCAS 1894). Their friendship extended to shared fieldwork, including the Snowy Mountains expedition. LUCAS (1937: 159) recalled how he and FLETCHER, for LUCAS' introduction to the Blue Mountains, walked 16 km overnight from Bell railway station to Mt King George, reaching the summit at 0600 hrs.

FLETCHER'S interest in aspects of the natural history of frogs, rather than the simple description of new taxa, also transferred to LUCAS, who included natural history data in species accounts in his second herpetological paper, "The Lizards Indigenous to Victoria" (LUCAS & FROST 1894), which was essentially an amalgamation of morphological descriptions from BOULENGER (1885–7) with new distributional data and natural history observations. This trend towards the documentation of field observations also continued to the HORN Expedition Report, and was a major factor in the effect of that Report on Australian herpetology.

2.3. Charles FROST (?1853–18.ix.1915)

FROST's contributions to herpetology are almost exclusively linked to Arthur LUCAS, and he remains the least-known of the major contributors to Australian herpetology of the period, probably due to his non-institutional background.

Apart from his publications, FROST's life is known only from a single obituary (ANONYMOUS 1915), several comments published in the Victorian Naturalist and in papers by others, and oral history at the Museum of Victoria. His obituary states that he died at the age of 62, giving a year of birth of 1853.

FROST first came to notice at the Field Naturalists' Club of Victoria in the late 1880s, when he occasionally exhibited specimens at meetings, including two snakes at a meeting in July 1888 (at the age of 35, making him a relatively late starter in science). He became a member of the Club's Committee in the 1889–90 year, was a Vice-President from 1891 to 1894, and Treasurer from 1894 to 1898. He was an enthusiastic attendee at Society field trips, participating in excursions to Fern Tree Gully in 1892 and 1893, Nar-Nar-Goon in 1893, and leading excursions to Sassafras Gully and Warrandyte in 1894. He was also a participant in three of the Club's major expeditions, to King Island (xi.1887), Croajingolong (xii.1888–i.1889) and Yarra Falls (xi.1890), the latter as leader.

FROST also made independent collecting trips. SPENCER (1901) noted that the first five specimens of the frog he described as *Philoria frosti* were obtained by FROST while camped at Mt Baw Baw in 1898 (regurgitated by a tiger snake, *Notechis scutatus* (Peters, 1861)), and that FROST also collected the other two types on a later occasion.

Apart from reptiles, FROST's early interests included spiders and birds. He contributed three papers on spiders to the Victorian Naturalist (FROST 1888, 1890, 1891), and read at least two others at meetings, and con-

2 It is also worthy of note that at least two other publishing herpetologists were educated at Newington: the present author, and the late Stephen J. COPLAND (1907–19.viii.1981) (Anonymous 1981), who published extensively on frog and skink systematics between 1946 and 1963.

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tributed the bird list for the Croajingolong expedition report (FROST 1889).

During this period, Frederick MCCOY, Director of the National Museum of Victoria, was seen as the leading herpetologist in Victoria, primarily due to the continuing publication of his Prodromus of the Zoology of Victoria series. However, with the cessation of this series and the publication of LUCAS and FROST'S (1894) catalogue of the lizards of Victoria (read at the meeting of the Royal Society of Victoria on 13.iv.1893), MCCOY's influence waned and FROST became the primary source of reptile identifications to members of the Field Naturalists' Club, contributing reptile lists to reports of fieldwork by others (FROST 1894a,b; FRENCH & FROST 1894).

FROST's interests in herpetology were undoubtedly nurtured by LUCAS and SPENCER, who possessed the academic training and scientific writing skills lacked by FROST. All were members of the Field Naturalists' Club and members of the Club's Committee, LUCAS also editing the Victorian Naturalist. Curiously, however, although collaborative work between LUCAS and FROST began as early as 1892 (LUCAS 1892), their 12 joint papers (FROST & LUCAS 1894; LUCAS & FROST 1894, 1895a, 1895b, 1896a, 1896b, 1896c, 1897, 1900, 1901, 1902, 1903), together with FROST's other solo herpetological paper (FROST 1895), were published (mostly in Victoria) after LUCAS left Melbourne for Sydney. Despite being the major Melbourne-based herpetologist of this period, FROST was not a member of the Royal Society of Victoria, but did become a Fellow of the Linnean Society on 3.xii.1891 (although he never used the Linnean Society's publications as an outlet for his own work). Why he became a member of a British scientific society and not the local equivalents is not known, although the British Fellowship did allow him to append the letters F.L.S. to his name in publications, and may have been encouraged by LUCAS and SPENCER in lieu of formal academic qualifications.

Oral history at the Museum of Victoria (J. COVENTRY, Melbourne, pers. comm.) is that FROST worked on the Museum of Victoria herpetology collections on a voluntary basis, which is in agreement with most of the type material of species that LUCAS and FROST described being in that institution, and the lack of any other person experienced with herpetology on staff during the period. It was presumably because of FROST's presence that a collection of reptiles was sent from the Western Australian Museum to the Museum of Victoria for identification in 1901 (LUCAS & FROST 1902; J. COVENTRY, Melbourne, pers. comm.).

Despite the geographic separation of FROST's activities at the Museum of Victoria and LUCAS' life as a teacher in Sydney, it is clear that both actively participated in their joint research activities. LUCAS (1892) wrote that MCCOY had "afforded (him) all facilities for examining the specimens which are preserved in the National Museum", prior to his departure for Sydney, and his later autobiography (LUCAS 1937: 140) reported similar access to the lizard collections. After his departure, LUCAS returned regularly to Melbourne for holidays (LUCAS 1937; CARTER 1937a), and was present in Melbourne in July 1894 and July 1895, when he attended meetings of the Field Naturalists' Club. It was presumably during the latter period that he and FROST worked together on the HORN Expedition report, although he also examined material while in Sydney, including the collections of the MACLEAY Museum (LUCAS & FROST 1896a: 116), which were unavailable to FROST.

Charles FROST's activities after ceasing writing in 1903 are poorly-known, although he continued to live in Kew, a Melbourne suburb, maintaining a collection of preserved reptiles which were donated to the Museum of Victoria after his death from heart attack, by his brother Jack. Unfortunately, locality data were not provided for much of this material (J. COVENTRY, Melbourne, pers. comm.).

FROST is honoured herpetologically by the patronyms *Lerista frosti* (Zietz, 1920) and *Phiioria frosti* Spencer, 1901.

Curiously, despite the close association between FROST and LUCAS, which extended in later years to FROST's provision of photographs of live snakes and lizards for LUCAS' popular book on Australian fauna (LUCAS & LE SOUEF 1909), LUCAS makes almost no mention of him in his autobiography (LUCAS 1937), referring only to "my dear friend Charles FROST" on one occasion (p. 152).

2.4. Walter Baldwin SPENCER (23.vi.1860–14.vii.1929)

SPENCER's life has been thoroughly documented by MULVANEY & CALABY (1985), from which much of the following account is derived.

Walter Baldwin SPENCER was born in Manchester, the son of a textile manufacturer and merchant. He was educated at Old Trafford School (1872–1878). Although passing both Oxford and Cambridge Local Examination, and fulfilling the University of London matriculation requirements, he initially studied briefly at the Manchester School of Art, then at Owen College (later Manchester University) in medicine (a subject which, though studied at Manchester, was examined in London), beginning in 1879. Here he came under the influence of Arthur Milnes MARSHALL, the newly-appointed Professor of Zoology, who also worked with FLETCHER and later LUCAS at Cambridge. MARSHALL, known herpetologically for his frequently reprinted monograph

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(MARSHALL 1882) on the frog, proved inspirational to the young SPENCER. By the end of his second undergraduate year, SPENCER had collaborated with MARSHALL on a paper (MARSHALL & SPENCER 1881) on the cranial nerves of the dogfish. At about this time, he also won the DALTON Prize in Natural History (PESCOTT 1954: 90). Following this, SPENCER transferred to Oxford, entering Exeter College in October 1881. Here, he was influenced in his zoological studies by Henry Nottridge MOSELEY, Professor of Anatomy (recently returned from the Challenger Expedition, which had visited Australia) and E. Ray LANKESTER, MOSELEY's successor. SPENCER's burgeoning interests in biology and comparative anatomy detracted from his medical studies, and he failed his medical examinations at the University of London in 1883. However, in 1884 he graduated from Oxford with a first in Biology.

The following year, SPENCER became assistant to MOSELEY, demonstrating in practical classes and lecturing comparative anatomy, and in 1886, he became the inaugural Fellow in Biology at Lincoln College. Between 1884 and 1886, he wrote eight papers, five of which were on herpetological subjects (SPENCER 1885a, 1885b, 1886a, 1886b, 1887), including frog embryology and the pineal eye of squamates. The final paper of this latter project, published in the Quarterly Journal of Microscopical Science, featured hand-coloured plates, all 1500 copies of which were tinted by SPENCER, his fiancée, and his friend Gilbert BOURNE in a one-week period, and is still considered a major contribution to the subject (EAKIN 1973).

In 1886, the Chair of Biological Science at the University of Melbourne was advertised. A very strong field applied, including T.J. PARKER and W.A. HASWELL (later to write a standard zoology text of the period: PARKER & HASWELL 1897). SPENCER's selection from this field is thought to have been on the basis of his strong publication record and good testimonials from (among others) MARSHALL, MOSELEY and LANKESTER, as well as colleagues in other fields and students. He was appointed to the Chair in January 1887, departing England on 18.ii.1887 and arriving in Melbourne 30.iii.1887, at the age of 26.

SPENCER's activities rapidly developed close parallels with LUCAS, who soon became a close friend, and was given a key to SPENCER's rooms (LUCAS 1937:153). Although SPENCER's biological studies in England had been laboratory-based, he quickly developed an interest in field studies on arrival in Australia, and within seven months was hunting giant earthworms with LUCAS in Gippsland. Two months later, in November 1887, he joined the King Island expedition of the Field Naturalists' Club of Victoria, along with Charles FROST. SPENCER wrote and illustrated the narrative of this expedition (SPENCER et al. 1888), which collected six species of snakes and lizards (LE SOUEF 1888; one additional species of snake recorded, *Pseudonaja textilis* (Duméril, Bibron & Duméril, 1854), does not occur on the island, and is presumably a misidentification of one of the other three species collected). Other major expeditions followed, including those to Croajingolong and Yarra Falls with the Field Naturalists, both trips also attended by FROST. In September–October 1891, he mounted a major expedition (SPENCER 1892) to Gayndah in Queensland in search of eggs and embryos of the Queensland Lungfish (*Neoceratodus forsteri* (Krefft, 1870)). Although this was unsuccessful, his visit coincided with that of the German biologist Richard SEMON (who had the same aim), and led to an invitation to contribute a paper on the lungs of *Neoceratodus* to the report of SEMON's Australian expedition (SPENCER 1898), and to visit SEMON in Jena. One year after the Queensland expedition, SPENCER collected around Dimboola and the Wimmera River, followed by a visit in the summer vacation of 1892/93 to Lake St Clair in Tasmania, where he collected the specimens that provided FROST and LUCAS' first reptile description (the skink *Hemisphaeriodon tasmanicum* Frost & Lucas, 1894, later to prove synonymous with *Cyclodomorphus casuarinae* (Duméril & Bibron, 1839)).

In early 1888, the year following his arrival, SPENCER became a council member of the Royal Society of Victoria, becoming secretary/editor the following year. The year 1888 also saw SPENCER's first Australian trip outside of Victoria, when he attended the inaugural meeting of the Australasian Association for the Advancement of Science meeting in Sydney as the Society's delegate. It was at this meeting that he met Joseph FLETCHER for the first time and the two rapidly developed a close friendship (MULVANEY et al. 2001: 273, 402, 482), which extended in later years to SPENCER staying with FLETCHER during annual visits to Sydney *en route* to holidays in New Zealand. Also in his first three years in Melbourne, SPENCER formed a Science Club at the University, he and LUCAS were members of the same government committees enquiring into the establishment of a Port Phillip Biological Survey and the reservation of Wilson's Promontory, and SPENCER was general secretary for the second AAAS meeting in Melbourne. In 1893, he visited Europe, and on his return to Australia in 1894, he began writing popular articles on science for the local press, in addition to his teaching and administrative duties.

In 1894, SPENCER was invited to participate in the HORN Expedition (see below), and subsequently edited the report of that expedition.

The combination of winter and a drought season during the expedition resulted in SPENCER's dissatisfaction

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with the collections made. Consequently, he returned to Charlotte Waters in February 1895, making further collections after rain. The observations made during this visit, together with collections sent to him by Frank GILLEN, Patrick Michael ("Pado") BYRNE and Charles Ernest COWLE between 1895 and 1896 (MULVANEY et al. 2000, 2001), were incorporated in the Horn Expedition Report.

Recalcitrance on the part of Edward STIRLING, the expedition's official anthropologist, led to GILLEN producing, at SPENCER's request, an anthropological memoir for the report, initiating a series of SPENCER-GILLEN collaborations. Between mid-November 1896 and 8 January 1897, SPENCER revisited Alice Springs to work with GILLEN in documenting a series of aboriginal ceremonies, and took the opportunity to make further biological collections. These, however, were too late for inclusion in the HORN Expedition Report, and the anthropological studies became the basis for their first major monograph, "The Native Tribes of Central Australia" (SPENCER & GILLEN 1899).

In 1895, soon after his return from central Australia, SPENCER was appointed a member of the Board of Trustees of the Public Library, Museums and National Gallery of Victoria, a blanket administrative umbrella for the major public institutions. By 1899, he had become Vice-President, and with MCCOY's death in the same year, also became simultaneously President of the Museum Committee and Director of the National Museum of Victoria. He immediately began lobbying for new museum buildings, new exhibitions, and transfer of the existing collections to new accommodation.

In 1901, a further period of fieldwork ensued. The SPENCER-GILLEN Expedition left from Oodnadatta on 19.iii.1901, travelling through Charlotte Waters and Alice Springs, before moving to new collecting grounds at Barrow Creek, Tennant Creek, Powell Creek and Borroloola. The onset of the wet season led to the party becoming trapped at Borroloola for three months before being evacuated by boat to Normanton, departing from there for Brisbane on 1.iii.1902. As with previous expeditions, the anthropological results became the basis for a major book (SPENCER & GILLEN 1904), which also incorporated the results of a brief visit to tribes north of Lake Eyre in August 1903. Although no coordinated zoological report resulted from the SPENCER-GILLEN Expedition (SPENCER's focus in this and subsequent fieldwork was primarily anthropological), the zoological collections made did include a new varanid, *Varanus spenceri*[3], named by LUCAS & FROST (1903), while one of the skink specimens was subsequently (STORR 1969) nominated as the holotype of *Ctenotus robustus*.

Between 1903 and 1911, SPENCER was heavily involved in administrative duties, becoming President of the Professorial Board and a member of the University of Melbourne Council, coinciding with a Royal Commission into the University's finances and activities. He was also appointed to a variety of Government Committees into education in general.

At the end of 1911, SPENCER visited the Top End of the Northern Territory between June and August, collecting and making anthropological observations at Melville Island, Pine Creek, Katherine and Roper Bar, although based mostly in Darwin. This visit led to his being appointed Chief Protector of Aborigines, spending the whole of 1912 in the Top End at this task. Some time was set aside for fieldwork, including six weeks in March to April on Melville and Bathurst Islands, the period June to July at Oenpelli, a pioneering car-based overland trek from Darwin to Borroloola between August and September, and a return to Bathurst Island in December. Again, the anthropological observations led to a book (SPENCER 1914).

In addition to his scientific interests, SPENCER became a major patron of the arts, and visited England in 1916 on behalf of the National Gallery of Victoria. He also served as President of the Victorian Football League between 1919 and 1926.

Finally worn out by his workload, SPENCER retired from the University in June 1920, although he still retained his position at the National Museum. He revisited Alice Springs in winter 1923 to report on aboriginal welfare, and again in 1926. This was his last Australian fieldwork. He travelled to England in mid-1927, ostensibly for a short visit, but stayed for the next year and a half, writing his final book, "Wanderings in Wild Australia" (SPENCER 1928), a popular narrative of his field expeditions. On 19.ii.1929, he left England for an anthropological expedition to Tierra del Fuego with his companion Jean HAMILTON. Overworking himself in the cold, wet climate, he died there on 14.vii.1929.

Although SPENCER's later scientific career and fame was primarily in anthropology, he published about 50 papers in biology (MULVANEY & CALABY 1985). Of these, nine were herpetological in nature or had herpetological relationships. Apart from the five written prior to moving to Australia, which undoubtedly played a major role in obtaining the position that launched his career, he wrote two papers on frogs (SPENCER 1896c, 1901) and two on pentastomids obtained from the lungs of the copperhead snake (*Austrelaps superbus* (Günther, 1858)), including material collected on his visit to King Island with FROST and the Field Naturalists' Club

3 Two other herpetological patronyms honour Spencer: the frogs *Limnodynastes spenceri* Parker, 1940, and *Litoria spenceri* Dubois, 1984.

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(SPENCER 1888, 1893). In addition to the herpetological work of SPENCER himself, he was also instrumental in establishing the careers of Arthur DENDY (1865–1925; see below) and Georgina SWEET (1875–1946). The latter began as his assistant demonstrator at the University, and later became the University's first woman associate professor, teaching in biology and veterinary science (MACCALLUM 1990). SWEET published a few papers on amphibian anatomy and vertebrate parasitology, including reptile parasites (SWEET 1897, 1908a,b, 1909, GILRUTH et al. 1910), among a wide range of topics.

Despite the quality of his work on the pineal eye of lepidosaurs, SPENCER is best remembered in zoological circles today for his biogeographical interpretations. This work, first expounded in the HORN Expedition report (SPENCER 1896b), recognised the distinction between arid, tropical and cool climate faunas in Australia, and applied the names Eyrean, Torresian and Bassian to these faunas. However, it has its roots in earlier work, notably by FLETCHER, who had recognised similar patterns in the Australian frog fauna. The account of the reptile fauna of the HORN Expedition provided by LUCAS & FROST (1896a) also provided much of the detail used by SPENCER in devising his scheme. FLETCHER also played a more direct role in SPENCER's herpetological output, providing advice for the HORN Expedition amphibian report (SPENCER 1896c) and encouraging SPENCER to write his second amphibian systematics paper (SPENCER 1901).

In summary, at the beginning of 1894, when the HORN Expedition was initiated, SPENCER was ensconced as Professor of Biology at the University of Melbourne, his thoughts turned towards herpetological matters by association with MARSHALL in England, and later by FROST and LUCAS in Australia, and towards biogeography by FLETCHER's work on frog distributions, and with a love of fieldwork nurtured by LUCAS and FROST. LUCAS, who had been instrumental in creating the position that caused SPENCER to move to Australia, and who had started to write on herpetological systematics (stimulated by FLETCHER and FROST), had moved to Sydney one year before, becoming closely associated with FLETCHER, while FROST, who had guided SPENCER in fieldwork, and collaborated with LUCAS in his herpetological studies, was becoming a significant figure in the Field Naturalists' Club of Victoria, and the major herpetologist remaining in Victoria.

The close relationship between these four figures extends not only to herpetology, but to a common interest in earthworms, planarians and onychophorans (also shared with Arthur DENDY, SPENCER's laboratory assistant, who subsequently became Professor of Zoology at Canterbury College in New Zealand and later at the University of Cape Town and King's College, London (SMITH 1981), and would further extend SPENCER's pioneering work on the pineal eye and brain of *Sphenodon*, as well as publishing on the embryology of the genus; DENDY 1899a, 1899b, 1909, 1910, 1911). As illustration of this association, not only did SPENCER, FLETCHER and DENDY publish on these invertebrate groups, but each of the five had a planarian named after them, DENDY (1889, 1890) naming *Geoplana spenceri*, *G. lucasi* and *G. fletcheri*, and SPENCER (1891) naming *G. frosti* and *G. dendyi*.

3. THE HORN EXPEDITION (5.V.–7.VIII.1894) TO CENTRAL AUSTRALIA, A NEW GEOGRAPHIC DIRECTION IN AUSTRALIAN HERPETOLOGY

On 8.iii.1894, the wealthy pastoralist and mining magnate William Austin HORN (1841–1922), who had been a member of the South Australian House of Assembly between 1887 and 1893, wrote to the South Australian Premier offering to fund a scientific expedition to central Australia, and inviting the Premier to nominate two scientists to accompany the expedition, and further to request the Premiers of New South Wales and Victoria to nominate one additional scientist each. HORN's underlying motives in proposing the expedition are unknown, but have been suggested to be the desire for a knighthood, like Sir Thomas ELDER, the pastoralist who had financed the ELDER Expedition only three years before, or the possibility of discovery of gold or gemstones, although both were explicitly denied by HORN (BROWN 1983; MULVANEY & CALABY 1985: 116, 118; MULVANEY 1996: 4).

The offer was promptly accepted, with the South Australian Government appointing Professor Edward STIRLING (1848–1919) of the South Australian Museum as anthropologist and medical officer, and Professor Ralph TATE (1840–1901) of the University of Adelaide as botanist and palaeontologist (MULVANEY & CALABY 1985). The New South Wales Government nominated John Alexander WATT (1868–1958), a recent geology graduate from the University of Sydney (possibly through the intervention of his major professor, T.W. Edgeworth DAVID) to serve as geologist and petrologist (BRANAGAN 1996), and the University of Melbourne was asked on 5.iv.1894 to release Baldwin SPENCER from his duties to allow him to participate as biologist and photographer (MULVANEY 1996: 4). Within a month, the expedition had been fitted out, and departed from Oodnadatta, the northern railhead.

Unlike all previous expeditions, the HORN Expedition aimed not to explore previously uncharted territory, but to record the geology, biology and anthropology of an area which had not only previously been traversed several times, but was even then gradually becoming settled (albeit sparsely) by Europeans. Many of the collect-

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ing sites of the expedition were stations on the overland telegraph line, police outposts or remote cattle grazing properties. Further, the short time available for the expedition (limited in part by SPENCER's three-month release from duties; WINNECKE 1897: 61) restricted the possibility of more extensive explorations.

Travelling by camel, the expedition left Oodnadatta on 5.v.1894. The published journal of Charles WINNECKE, the experienced bush traveller who was appointed field guide to the party of scientists, as well as surveyor, mapmaker and meteorologist (MULVANEY 1996: 5), provides the most accurate account of collecting sites and dates (WINNECKE 1897). The following summary of the movements of the expedition emphasises the known collecting sites reported in the herpetological accounts of the report (LUCAS & FROST 1896a; SPENCER 1896c). Although a number of sites were visited, most collections were made over remarkably short time periods, from hours to a few days. The vast majority of the duration of the expedition was spent travelling on the backs of camels (MULVANEY & CALABY 1985: 120), exasperating SPENCER, who was unable to stop to collect the lizards seen (SPENCER 1896a: 3).

Initially, the expedition mostly followed the Alice Springs track north, stopping briefly at Storm Creek at midday on 6.v.1894 (*Heteronotia binoei* (Gray, 1845) noted in the report), Dalhousie Springs for an hour of collecting during the day on 9.v.1894 (three lizard species, including one of the types of *Tympanocryptis tetraporophora* Lucas & Frost, 1895b, were reported by LUCAS & FROST 1896a), and Opossum Creek on 10.v.1895 (five species reported by LUCAS & FROST 1896a), and camping overnight at several creek crossings and waterholes, including Adminga Creek on 11.v.1895 (Camp 7), where the other type of *T. tetraporophora* was obtained. WINNECKE (1897: 7) notes "additions to the ornithological, botanical, biological, and geological collections have been made, not only at this point, but at every camp and on every possible opportunity during the journey". The Expedition arrived at Charlotte Waters Telegraph Station on 12.v.1894 at about sundown, and camped about one mile north, near a large waterhole on Coglin Creek (Camp 8, misnumbered as 7 in WINNECKE's Journal). On the following day, the expedition departed about midmorning[4]. It is clear from the short period of time spent at Charlotte Waters that the large number of species listed from that locality by LUCAS & FROST (1896a) were derived almost exclusively from SPENCER's subsequent visit to the quent visit to the region in February 1895, and from collections made by Patrick Michael (Pado) BYRNE (1856–1932), the local telegraph operator, customs officer, artesian bore operator, Justice of the Peace and amateur geologist (MULVANEY & CALABY 1985: 121; CALABY 1996; MULVANEY et al. 2000), who had evidently been impressed by SPENCER's zeal, despite the brevity of their first meeting.

After Charlotte Waters, the party travelled along the Goyder River, spending one day (15.v.1894) collecting around Camp 10 on the Goyder, during which one of the types of *Ablepharus lineoocellatus* var. *ruficauda* Lucas & Frost, 1895b, reported from the Goyder, was presumably collected. On the following day, the main party, including SPENCER, departed for Crown Point Station, arriving there that night, and collecting around this locality on the following two days, departing on 19.v.1894. Three species of reptile (the common gecko *Heteronotia binoei* and two snakes) were reported from Crown Point by LUCAS & FROST (1896a). In the meantime, a party consisting of WINNECKE, WATT and one of the aboriginal assistants, travelled further west, arriving at the rendezvous point, Horseshoe Bend Station, Engoordina (Camp 15), on 20.v.1894, where they were rejoined by the main party later in the day. LUCAS & FROST (1896a) reported a single snake, *Furina ramsayi* Macleay, 1885, from Horseshoe Bend. On the following evening, the expedition camped on Sullivans Creek at Idracowra, near the old station buildings, 3.5 miles from the new station, and collected in the area on 22–23.v.1895. WINNECKE (1897: 17) reports that natives brought in a large snake, a thorny devil (*Moloch horridus* Gray, 1841) and several other lizards at this site, although LUCAS & FROST (1896a) report only "*Amphibolurus maculatus*" (Gray, 1831) (see below for current identification) and the holotype of *Varanus eremius* from this locality (specific localities were not provided for *Moloch*, nor for the bearded dragon ("*Amphibolurus barbatus*" (Cuvier, 1829); see below for current identifications) in the report).

From Idracowra, the expedition travelled along the Finke River, camping overnight at two sites (Camp 18, 24.v.1894; Camp 19, 25.v.1894). At the latter site, WINNECKE (1897: 18) reported the collection of "a new kind of lizard". Although LUCAS & FROST (1896a) recorded two snakes from the Finke River, and three species of lizard from Finke Gorge (the latter locality presumably refers to Camp 42; SPENCER 1896a: 108), none were described as new. The party reached Henbury Station on 26.v.1895, spending the next day at this site, although no reptiles were reported from this locality. On the following night (28.v.1894), they camped on the Finke again (Camp 21). On 30.v.1894, they camped at Illamurta Police Camp, collecting around this site on the following day (one lizard species and two frog species

4 SPENCER (1896a:28) reports that the departure from Charlotte Waters was on 15.v.1894, implying a stay of several days. This date would seem to be erroneous in light of the dates in WINNECKE's Journal, unless the Expedition split at this point, with WINNECKE leading to the next camp, and SPENCER following several days later.

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are reported from this locality in the report). On 2.vi.1894, SPENCER, TATE and STIRLING departed from the main Expedition, arriving at Tempe Downs Station (Camp 26) that evening, while the main party took a more circuitous route, arriving at Tempe Downs two days later. Four species of lizard, including the type of *Rhodona tetradactyla* Lucas & Frost, 1895b, are reported from this locality. The Expedition camped at a waterhole at the entrance to the gorge of Bagot's Creek (Camp 29) on the evening of 8.vi.1894, and collected at this locality for the following day. Five species of lizard were reported from Bagot's Creek in the report, including one of the types of *Ablepharus lineoocellatus* var. *ruficauda*. After another day's travelling, the expedition collected at Reedy Creek (Camp 30) in the George Gill Ranges (at a waterhole at the foot of high perpendicular rocks). Four species of lizard and a snake were reported from Reedy Creek, Reedy Hole and the George Gill Ranges by LUCAS & FROST (1896a). While at Reedy Creek, WINNECKE (1897: 30) reported the arrival of a "rare lizard" sent from Tempe Downs (probably the unique specimen of *Rhodona tetradactyla*).

After Reedy Creek, the party split again, with SPENCER, WATT, the taxidermist BELT, E.C. COWLE, the Illamurta police representative, and the aborigine Larry, journeying to Ayer's Rock (now Uluru) and Mt Olga, departing on 13.vi.1894 and rejoining the main party at Glen Helen Station on 26.vi.1894. Few herpetological specimens are reported from this side trip, SPENCER (1896c) reporting only a few frogs and tadpoles. In contrast, the main party had more success. On 3.vi.1894, the main party travelled to Laurie's Creek (Camp 31), collecting around there on the next day, during which WINNECKE (1897: 32) reported the receipt from an aboriginal family of three lizards and a number of frogs (the skink *Egernia "whitii"* (Lacépède, 1804) was reported by LUCAS & FROST, 1896a). On 15.vi.1894, the party travelled to Glen Edith Station (Camp 32), collecting on the way a snake, *Pseudonaja nuchalis* Günther, 1858 (LUCAS & FROST 1896a), and on the following day, moved to Deering Creek (Camp 33), where one of the aborigines (Mennawurta) collected "a new species of tree lizard" (WINNECKE 1897: 34; presumably one of the syntypes of *Varanus gilleni*, recorded from between Glen Edith and Deering Creek by LUCAS & FROST 1896a). After several days more travelling about the area (including whole days spent collecting near Stokes Pass, and at Oondoomoolla Waterhole), the main party rejoined the Ayer's Rock group at Mt Zeil, one and a half miles from Glen Helen Station, on the appointed day. A single lizard species was reported from Glen Helen by LUCAS & FROST (1896a), probably collected by SPENCER's group while waiting for the main party.

Together again, the expedition camped at Mt Sonder (Camp 40) on the evening of 26.vi.1894, and collected around this locality for the next two days. WINNECKE (1897: 46) reported the collection of "an enormous carpet snake, fully 8 ft in length" by the prospectors, presumably the specimen of *Aspidites melanocephalus* (Krefft, 1864) [=*A. ramsayi* (Macleay, 1882), see below] mentioned by SPENCER (1896a: 109) from near here, although no such snake is listed by LUCAS & FROST (1896a) from this locality. The next campsite was in the Mereenie Valley (Camp 41), through which flows Darwent Creek. Two lizard species were reported from Darwent Creek (LUCAS & FROST 1896a). From here, the expedition travelled to Hermannsburg Mission Station (Camp 43), arriving on the evening of 2.vii.1894, after a further day's collecting at another site (Camp 42) on the Finke River. The Expedition stayed in the vicinity of this camp until 9.vii.1894, although during this period, a day trip to Bagot's Creek was reported, and SPENCER and TATE spent three days at Palm Creek. LUCAS & FROST (1896a) recorded ten lizard species from this locality, although SPENCER (1896a: 117) reports eleven species, listing ten, one of which (*Morethia ruficauda*, as "a new red-tailed variety of *Ablepharus lineoocellatus*") was not listed by the former authors (curiously, LUCAS & FROST give only two localities, Goyder River and Bagot's Creek, for this species, while SPENCER describes it as "somewhat widely spread, being found from Alice Springs in the north to the Goyder River in the south"). One of the lizards, and an additional snake, were also recorded from Hermannsburg (LUCAS & FROST 1896a).

On 10.vii.1894, the party again divided, with the main group travelling to Alice Springs via Owen Springs, reaching their destination on 12.vii.1894. The smaller party, of WINNECKE, SPENCER, BELT and two other men, detoured to Paisley's Bluff in the MacDonnell Ranges. This was reached on 12.vii.1894. Only a single lizard species is recorded in the report from this site. This group subsequently reached Alice Springs on 15.vii.1894, the expedition camping near the Police Station at Heavitree Gap (Camp 50). Although the expedition departed on 18.vii.1894 for Oodnadatta (including evening campsites at Crown Point Station (26.vii), the Goyder River (27.vii), Charlotte Waters (29.vii), Adminga Creek (30.vii) and near Storm Creek (4.viii), arriving at Oodnadatta on 5.viii.1894), SPENCER elected to remain at Alice Springs until 4.viii.1894, when he caught the mail coach to Oodnadatta and rejoined the others. The expedition left Oodnadatta by rail for Adelaide on 7.viii.1894.

The long period of time at Alice Springs not only allowed SPENCER the opportunity to make more extensive biological collections (17 species of reptiles and amphibians are specifically reported from this locality in the report, the largest number from a single site other than Charlotte Waters), but also resulted in a close

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friendship developing between SPENCER and the telegraph station-master, Frank GILLEN (1855–1912). This friendship had two consequences. Firstly, it turned SPENCER's interests towards anthropology, a direction that was to consume much of his subsequent time and publication output, as well as influence his subsequent fieldwork, and it stimulated GILLEN to act as a biological collector for SPENCER (CALABY 1996; MULVANEY et al. 2001).

4. THE REPORT OF THE HORN EXPEDITION, FURTHER NEW DIRECTIONS IN AUSTRALIAN HERPETOLOGY

On returning to Melbourne, the reptile collections were placed in the hands of LUCAS and FROST for further study, while SPENCER himself worked on the amphibians. The first preliminary paper on the reptile collections (LUCAS & FROST 1895b), describing six new lizards, was read at the Royal Society of Victoria meeting on 13.xii.1894, only four months after the return of the expedition. The second taxonomic paper (LUCAS & FROST 1896b), describing three new species, was read at the same society on 9.iv.1895. However, delays in the issuing of the next issue of the Proceedings of the Royal Society of Victoria (published April 1896) meant that the full account of these latter species, including new material received from SPENCER in 1895, that was published in the report (dated February 1896; MULVANEY & CALABY 1985: 134) antedated the intended description. The third taxonomic paper on reptiles obtained via SPENCER (LUCAS & FROST 1897), in which *Diplodactylus conspicillatus* and *Ophidiocephalus taeniatus* were described, is based on material sent by BYRNE to SPENCER. This paper, a preliminary version of which (describing the gecko only), was read at the Royal Society of Victoria on 13.viii.1896, was again delayed in publication, being issued in March, 1897 (the holotype of *Ophidiocephalus* is presumably the "worm-like snake" sent by BYRNE on 30.iv.1896; the previous package of lizards sent by BYRNE on 6.ii.1896 had included geckos (and hence possibly the holotype of *D. conspicillatus*), which had been specifically sought by searching with lanterns by night; MULVANEY et al. 2000: 230, 234). Thus, the mention of both species in the addendum to the Zoology Report (ANONYMOUS 1896), issued September, 1896, constitutes the first mention of these species in the literature[5].

The four volume published Report of the HORN Expedition contains five accounts of herpetological interest. In the narrative, SPENCER (1896a) includes a number of field observations on the reptiles and amphibians seen. SPENCER (1896b), in summarising the results of the expedition, also includes biogeographic and natural history comments additional to the two formal herpetological chapters, on reptiles (LUCAS & FROST 1896a) and amphibians (SPENCER 1896c). Finally, several additional herpetological records are provided in an appendix to the first volume (ANONYMOUS 1896).

Until the HORN Expedition, accounts of the herpetological findings of Australian expeditions, both locally-based and European-funded, had primarily concentrated on description of new species. Undoubtedly part of the reason for this is that the collectors on the expeditions were not the describers of the new taxa, while those systematists, such as the DUMÉRILS, John Edward GRAY, Albert GÜNTHER, George BOULENGER and Wilhelm PETERS, who ultimately described the species, only received the preserved material several months later, via a variety of routes. Documentation of the collections was often sadly lacking, with no indication of dates of collection, precise localities or habitats (often the only localities have been subsequently shown to be shipping ports for the collections). Dissection of the collected specimens was rarely performed, probably due to a combination of lack of interest in reproduction or diet, and the perception of damage to the few available specimens of each species.

In contrast, probably due to SPENCER's prior training in anatomical dissection, no such restrictions were placed on the HORN Expedition herpetological collections[6]. LUCAS & FROST's (1896a) lizard account includes reproductive data, both clutch sizes and more importantly seasonality, data derived from dissection of specimens. It is noteworthy that most of the reproductive data (*Lialis burtonis* Gray, 1835, "*Amphibolurus maculatus*", "*A.*" *reticulatus* (Gray, 1845), "*A.*" *pictus* Peters, 1866, *Diporiphora winneckei* Lucas & Frost, 1896a, "*Physignathus*" *longirostris* (Boulenger, 1883), *Moloch horridus*; see below for current generic and species identifications for some of these) indicate late summer breeding, and hence are derived from the collections made during SPENCER's second, post-HORN visit to Charlotte Waters. Dietary data are also given for one species (*Diporiphora winneckei*), although it is not known if this is derived from SPENCER's field observations or dissection of stomach contents. Data on reproduction on Australian reptiles were extremely scanty prior to the HORN Expedition, and largely anecdotal (e.g., NIND 1832; MOORE 1884: 87, 149; GÜNTHER 1858: 211, 214, 216, 217; KREFFT 1866a, 1866b, 1869, 1871; HAACKE 1883, 1885, with some additional data

5 The description of the latter species also constitutes the earliest Australian record of the use of radiography to investigate skeletal structure of reptiles of which I am aware.

6 SPENCER firmly believed in the importance of anatomical dissection for teaching and research, and developed his own collection at the University of Melbourne for this purpose (MULVANEY & CALABY 1985: 244). Some of his central Australian collections at the University were later dissected by SWEET (1908a).

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contributed by FLETCHER 1883c and LUCAS & FROST 1894). That most of these publications received little subsequent mention in contemporary literature perhaps indicates the lack of interest in such observations at the time; consequently these observations have been largely overlooked by more recent workers. Some of the unsubstantiated statements on clutch size provided by KREFFT (1866b, 1869) have subsequently been shown to be wildly incorrect (e.g., SHINE 1980, 1981, 1983, 1984, 1987, 1991), and must have been guesses.

The fact that a trained biologist with artistic abilities was the zoological collector on the expedition, a close collaborator with the authors of the reptile account, and the editor of the final work had two other happy consequences for the report.

Firstly, it allowed the inclusion of habitat data for many species. Previous herpetological publications had suffered by the lack of precise collecting localities (Sydney, Adelaide, Swan River, Tasmania, north-west Australia, and just Australia or New Holland, were the most common imprecise localities given by earlier accounts). The HORN Expedition Report not only included precise localities rather than just "central Australia", but also the microhabitats where the lizards were found. Although many species are recorded as found under logs and stones, several are specifically recorded as taken from burrows (*Varanus acanthurus* Boulenger, 1885, "*Egernia whitii*"), on trees, some under bark ("*Diplodactylus ciliaris*" Boulenger, 1885, *Gelyra variegata* (Duméril & Bibron, 1836), *Varanus gilleni*) or sheltering in piles of debris in creek beds ("*Physignathus*" *longirostris*), while others are noted as burrowing in sand (*Lialis burtonis*, "*Amphibolurus imbricatus*" Peters, 1876). For the first time, some indication was given of activity patterns, with comments on diurnal activity of some species, notably the agamids and *Ctenotus* species ("*Hinulia lesueurii*" (Duméril & Bibron, 1839)), and the comment that *Tiliqua* "*occipitalis*" (Peters, 1863) was not seen active during the day (crepuscular to nocturnal behaviour of the species concerned, *T. multifasciata* Sternfeld, 1919, has subsequently been confirmed; CHRISTIAN 1977). Although there had previously been some published information on habitat and microhabitat preferences of the Australian herpetofauna, notably by KREFFT (1863, 1866a, 1866b, 1869), it is clear that FLETCHER's interest in frog ecology provided the direct stimulus to SPENCER, LUCAS and FROST in this respect.

Secondly, it allowed the inclusion of detailed colouration notes on sexual dimorphism and breeding colours, liberally illustrated with colour plates. Both the notes and plates in the report are derived, at least in part, from sketches and preliminary paintings prepared in the field by SPENCER (MULVANEY 1996: 7), an advantage not available to previous herpetologists. Most previous illustrations of Australian reptiles had been monochrome (the illustrations in some copies of KREFFT 1869, are a notable exception), while almost all previous illustrations were derived from dead museum specimens that had often discoloured.

These new themes in Australian herpetological literature are most pronounced in SPENCER's (1896c) amphibian account. Here, he was not working via others, but was free to include all his field observations. His observations on the frogs include not only detailed comments on habitat and microhabitat preferences, but seasonal and ontogenetic changes in colouration, comments on calls, burrowing behaviour and diet. These field observations contribute the greater part of the amphibian account. In addition, SPENCER introduces a further new direction to Australian herpetology, detailed descriptions of tadpole morphology of three of the species encountered. Similarly, SPENCER'S (1896a) Narrative also includes many casual observations on the herpetofauna encountered, including a number not otherwise published in the formal accounts, and includes otherwise unpublished data on egg incubation times for the frog *Litoria aurea* (Lesson, 1829) (probably *L. raniformis* (Keferstein, 1867)) supplied by Alexander SUTHERLAND (pp. 19–20).

While these new directions in Australian herpetology were initiated or developed in the HORN Expedition Report, the question remains as to whether they had a lasting influence on the discipline. Certainly, they had little lasting effect on the authors themselves in herpetology. SPENCER's only subsequent paper on amphibians, and the later work of LUCAS and FROST on herpetology, reverted back to the more traditional morphological descriptive style of earlier authors. This may have been partly due to the loss of access to fresh material. The next generation of Australian herpetologists, LONGMAN, WAITE, FRY, ZIETZ and KINGHORN, were mostly traditional herpetological systematists, mostly based at museums. However, they did attempt to incorporate field observations where possible (e.g., ZIETZ 1914, 1915, 1917; WAITE 1915, 1917, 1925, 1927, 1929; LONGMAN 1916, 1918; KINGHORN 1921, 1923, 1924, 1931, 1932). Tadpole morphology was not touched again until MOORE's (1961) monographic study of Australian frogs, although HARRISON (1927: 284) indicated he had begun work on a monograph of Australian tadpoles, never published[7].

Several of the other themes developed by the HORN Expedition and its Report did take root, though slowly. The theme of publication of field observations on habi-

7 HARRISON died unexpectedly early in 1928, at the age of 48, from cerebral haemorrhage while on holiday (WALSH, 1983).

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tat and behaviour was carried on, initially in the Victorian Naturalist and later in the Proceedings of the Royal Zoological Society of New South Wales and the Western Australian Naturalist by a variety of amateurs, and also in more formal publications by Tom EADES (KELLAWAY & EADES 1929), Edgar WAITE (1925, 1927, 1929), Donald THOMSON (1933, 1934, 1935) and J.A. TUBB (1938). Herpetological exploration of central Australia continued via expeditions and collections by S.A. WHITE (ZIETZ 1914, 1915; WAITE 1915), Edgar Ravenswood WAITE (WAITE 1917; ZIETZ 1917), Carl STREHLOW (STERNFELD 1919, 1925[8]), Ellis leGeyt TROUGHTON and J.H. WRIGHT (KINGHORN 1924), H.H. FINLAYSON (LOVERIDGE 1938), and Cecil T. MADIGAN (KINGHORN 1945), the published reports often including field observations. Reproductive biology of reptiles, again including fieldwork in some cases, was continued by Thomas FLYNN, Launcelot HARRISON and Hazel Claire WEEKES at the University of Sydney (FLYNN 1923; HARRISON & WEEKES 1925; WEEKES 1927, 1929, 1930, 1933, 1935). FLETCHER and SPENCER's pioneering studies of the ecology of Australian frogs were continued by ENGLISH (1910), DAKIN (1920), BLANCHARD (1929), and particularly Launcelot HARRISON (HARRISON 1921, 1922, 1927) over the next few decades.

5. THE FATE OF THE HERPETOLOGICAL COLLECTIONS OF THE HORN EXPEDITION

Although the report of the HORN Expedition notes specific localities for all species that were not ubiquitous, the collections on which the report is based sadly now lack much data, with a high proportion being simply registered as "Central Australia". Further, because of the frequent lack of precise dates, and the registration of many specimens many years after the expedition's return, there are difficulties in unequivocally linking material with the HORN Expedition rather than one of SPENCER's subsequent central Australian journeys. However, as the report fully incorporates the material collected by SPENCER in February 1895, and the Appendix lists material sent to SPENCER from GILLEN, COWLE and BYRNE prior to his December 1896 Alice Springs expedition, this material can also be considered as contributing to the Horn Expedition discoveries. Thus, the difficulty is reduced to distinguishing this material from collections made by SPENCER in December 1896, during the SPENCER-GILLEN expedition of 1901, his Top End trips of 1911 and 1912, and final Alice Springs trips of 1923 and 1926, together with specimens sent from SPENCER's contacts post-September 1896, when the report was published. The recent publication of the numerous extant letters to SPENCER from COWLE, BYRNE and GILLEN (MULVANEY et al. 2000, 2001) provides useful indications of the extent and timing of herpetological collections sent from those sources to SPENCER: COWLE refers to sending frog and reptile specimens from Illamurta on 14.xi.1894 and 18.ii.1895, BYRNE sent frogs and reptiles from Charlotte Waters on 16.xii.1894, 24.v.1895, 21.vii.1895, 2.viii.1895, 20.xii.1895 (the latter included *Varanus gilleni*, *V. eremius*, *Diporiphora winneckei*, *"Egernia whitii"*, *Eremiascincus fasciolatus* (Günther, 1867) and *Ctenotus* sp.; MULVANEY et al. 2000: 281), 6.ii.1896 and 30.iv.1896, and GILLEN sent frogs and reptiles from Alice Springs on 12.x.1894, 2.ii.1895, 9.iii.1895, 7.xi.1895, 20.xii.1895, 31.i.1896, 14.vii.1896, 23.iii.1897, 18.vi.1897, 30.vii.1897, 10.ix.1897 and vi.1898 (GILLEN left the Alice Springs Telegraph Office in April 1899, transferred to Moonta, South Australia).

The bulk of the HORN Expedition and subsequent material was lodged in the Museum of Victoria and among SPENCER's own collection at the University of Melbourne, with material from the latter collection subsequently incorporated into the Museum of Victoria (COVENTRY 1970). COVENTRY suggested that as the expedition included representatives from South Australia and New South Wales the remainder of the HORN Expedition material may have been divided between Sydney and Adelaide. I have been able to locate HORN Expedition material in the Australian Museum, Sydney, but Adelaide does not seem to have received a share. Only two herpetological specimens in the South Australian Museum are possibly linked to the HORN Expedition: R1965 (*Nephrurus levis* de Vis, 1885, no locality, Dr ELLIOTT, HORN Expedition 1891) and R6663 (*Suta suta* (Peters, 1863), central Australia, no collector, but registered as *Hoplocephalus stirlingi* Lucas & Frost, 1896a). In both cases, the evidence is very slim. In the former case, the 1891 date does not accord with the HORN Expedition, and I am unaware of any association of a Dr ELLIOTT with the HORN Expedition, although the medical officer for the ELDER Expedition of 1891–92 had that name (PEAKE-JONES 1985). In the latter case, the evidence is circumstantial: the initial identification of the specimen, together with the possibility of STIRLING, who was director of the South Australian Musuem, being sent one of the specimens of the species bearing his name.

8 The collections from the vicinity of Hermannsburg Mission reported by STERNFELD were stated to have been obtained from Moritz Freiherr. von LEONHARDI. However, LEONHARDI, who was based in Frankfurt, was the editor of the anthropological memoirs of Carl STREHLOW (LEONHARDI 1907; STREHLOW 1907), who was in charge of the Hermannsburg Mission (LOHE 1977), and it is likely that he simply acted to transfer collections sent by STREHLOW to him, to the Senckenberg Museum. For this act, it is he, not STREHLOW, who is commemorated in herpetological nomenclature, by the skink *Ctenotus leonhardii* (Sternfeld, 1919). STREHLOW himself probably obtained the lizards from the aboriginal community at the Mission.

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In contrast, the Australian Museum in Sydney does contain undoubted HORN Expedition material. Further, during recent visits to Europe and America, material from SPENCER and HORN, potentially from the HORN Expedition, were encountered in the collections of the Natural History Museum, London, the Zoologisches Museum, Berlin and the American Museum of Natural History, New York.

5.1. Australian Museum, Sydney

HORN and SPENCER material in the Australian Museum comes from four sources. The first is a series of 36 specimens (R2092–2127) presented by W. HORN and registered between 4–11.xii.1896. All specimens in this series bear the locality central Australia only. As this material was registered prior to SPENCER's return from his third central Australian trip, and as there is no reason to assume that HORN was sent subsequent material from central Australia, it is presumed to be HORN Expedition material.

A second small series of specimens (R2141–2149) consists of three species, all presented by SPENCER and registered 1.ii.1897. This collection contains at least one species which could not have come from the expedition: two *Varanus gilleni* from Tennant Creek, a locality not visited by the expedition. Hence, it is presumed that this material postdates the expedition and other collections that were incorporated in the report.

The third source of material is the extensive herpetological collections of LUCAS, which were registered sporadically into the Australian Museum between 1907–1910. The central Australian material amongst these is: R3855 (*Lucasium damaeum* (Lucas & Frost, 1896a), Charlotte Waters), R4045–49 (*Ctenophorus isolepis* (Fischer, 1881), central Australia), R4052 (*Pogona* sp., central Australia), R4874–75 (*Ctenophorus caudicinctus* (Günther, 1875), Alice Springs, annotated as "specimens D,E HORN Expedition") and R4882–92, a series of 15 agamids of four species from central Australia, all annotated as "HORN Expedn specimens?"). These specimens are probably reference samples taken by LUCAS to Sydney when writing up the reptile report.

Finally, there are 13 frogs (R7440–45, R7552, R7557) with locality central Australia, all species reported by SPENCER (1896), among the frog collections of J.J. FLETCHER, registered into the Australian Museum on 1.ii.1922. As SPENCER acknowledged FLETCHER for assistance in preparing his frog chapter, and as FLETCHER was keen to obtain material from a variety of localities, these probably represent a reference sample sent from SPENCER to FLETCHER.

5.2. Natural History Museum, London

There are two series of herpetological specimens related to SPENCER and HORN in this collection. The series 97.1.20.1–37 and 97.1.20.64–68 are registered (20.i.1897) as presented by W.A. HORN Esq., West Park, Damerham, Salisbury, mostly with locality central Australia, although a few (97.1.20.4–5, *Gehyra variegata*, 97.1.20.28, *Cyclorana platycephala* (Günther, 1873), all three Charlotte Waters, 97.1.20.27, *Pseudonaja modesta* (Günther, 1872), Crown Point; 97.1.20.8, *Ctenophorus caudicinctus*, Alice Springs) have more precise localities. The *Pseudonaja* uniquely fits one of the HORN Expedition records, and the entire collection is probably from the expedition.

A second batch of specimens, 97.10.27.51–69, were presented by SPENCER and registered 27.x.1897. All specimens either have localities Charlotte Waters or Alice Springs. As this collection contains a specimen of *Varanus gilleni* from Charlotte Waters, of which only one specimen from this locality was available for the HORN Report (and this in the Museum of Victoria), it is probably that at least some of this collection, if not all, is derived from SPENCER's 1896 trip, which visited both localities, or includes some of the material sent by BYRNE and GILLEN.

5.3. Zoologisches Museum, Berlin

Four series of at least 30 herpetological specimens from central Australia presented by SPENCER are in this collection (registration numbers 11387, 13355–73, 13954–57 (this series with the locality Charlotte Waters) and 14003, some numbers with several specimens included, and not all registered specimens found). Dating of this collection is difficult, but 13310 has the date 1897 associated with it, and hence the SPENCER collection must be of about the same period or later. As it includes a *Varanus gilleni*, it may, like the SPENCER specimens in London, be derived from his 1896 expedition or the collections of BYRNE and GILLEN.

5.4. American Museum of Natural History, New York

The American Museum of Natural History holds almost 50 specimens with locality Central Australia (less commonly Alice Springs) received from W.A. HORN. These are registered, mostly by family or genus, among the early registrations in the current registration system (5, 11–12, 29, 43–50, 52, 54, 56–57, 409–14, 622–23, 626, 696–97, 724–25, 744, 1199–1203, 1222–23, 1979–80, 2134–35, 2593–94) and hence presumably represent material that was present in the collection at the time the registration system began. It is all presumed to be HORN Expedition material, as with specimens in other collections obtained from HORN.

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5.5. Museum of Victoria, Melbourne

Although the Museum of Victoria houses the largest component of the HORN Expedition herpetological collections, differentiation of the 1894–95 material from subsequent SPENCER collections is made especially difficult in this collection because the modern registration system did not commence until 1933 (SHEA 1999) and because the variety of early dates associated with the specimens may represent dates of collection, donation or registration into previous registration systems. Reregistration of material into the modern database occurred haphazardly in many cases, although there are some blocks of specimens. Conversely, identification of HORN Expedition material is facilitated by documentation of receipt of certain material between 1894 and 1907 (MCCOY 1896, 1897, 1898, KERSHAW 1901, 1907) in the Annual Reports of the Museum, with detailed lists of specimens donated, and some additional documentation of dates of receipt of SPENCER's collections by PESCOTT (1954). Because of the difficulties in marrying the early lists with the modern registration system, I have not attempted to identify every HORN Expedition specimen in this collection, but indicate the major blocks containing this material. I also exclude from discussion those SPENCER specimens that are unequivocally from his later expeditions (1901 and later)

The first block of specimens is the series D159–D289 (n = 131). Two dates are associated with all specimens in this series: 1896 and 23.vi.1916. The first part of the block has the locality Alice Springs (n = 43), and the first date more precisely given as xii.1896. A few specimens (n = 17) have other localities (Charlotte Waters, Bagot Creek, Oodnadatta, Finke Gorge, Derwent Creek, Tempe Downs, Hermannsburg, Palm Creek, Camp 11, Camp 23, Camp 25) while the rest simply have the locality central Australia. I interpret this material as follows: the date xii.1896 and locality Alice Springs in combination suggest that the first specimens are derived from SPENCER's 1896 expedition to Alice Springs in December of that year, and are hence not linked with the HORN Expedition or its Report. Further evidence for this interpretation comes from the inclusion in this series of several specimens of *Lophognathus gilberti centralis* (Loveridge, 1933), a taxon which was not recorded in the HORN Expedition Report. However, the few specimens with camp numbers are clearly derived from the HORN Expedition, while the other localities listed are also HORN Expedition localities. The date 1896 cannot be a date of donation, as the Annual Report for that year (MCCOY 1897) lists only 11 herpetological specimens received from SPENCER (some of which are unequivocally registered in other blocks). Instead, the date 23.vi.1916 is probably the date of first registration, as PESCOTT (1954) states that SPENCER donated about 300 reptiles, including his central Australian material, on 23.iii.1916 (although MULVANEY & CALABY 1985: 451 corrected the year to 1919, without providing evidence for this). Thus, some of this series is probably from the HORN Expedition, with the date 1896 erroneously applied sometime in the years between collection and donation.

The second block of material is D407–D478 and D492–D520, 101 specimens. Like the previous block, this series has two dates for each specimen, the later of which is 23.vi.1916. It probably represents the rest of the material SPENCER donated in that year. The first 44 specimens in this block have the locality central Australia and earlier date 1896, like the later part of the first block, and similarly cannot be excluded from identification as HORN Expedition material. The next 31 specimens have the locality Illamurta, collector E.C. COWLE and earlier date vi.1897 or vii.1897. This series presumably represents material sent by COWLE to SPENCER after the report's publication (MULVANEY et al. 2000; see also CALABY 1996 for comments on COWLE's mammals). The final 26 specimens variously have the localities Charlotte Waters, Alice Springs and central Australia, and lack a first date. This series may be HORN Expedition material.

A further 43 specimens within the series D1144–D1190 just bear the locality central Australia, and date 23.vi.1927. There is no collector associated with this series, and the donor is reported as "G. HORNE". Although STORR (1969) attributed three specimens from this series to the HORN Expedition, I am unaware of any link between a G. HORNE and the HORN Expedition, and believe that this material is unlikely to be part of the HORN Expedition collections.

The next significant block of SPENCER central Australian material is a series of eight, D1938–45, from Alice Springs with dates 1896 or xii.1896. I consider this post-HORN Report material, as for the first part of the first block.

Several early-registered specimens have dates in 1895 (D3256–57, D3259–60, D3263, D3283, D3381, D3399–401, D3412, D3421, D3424–25, D3556, D3566, D5416–19, D5703–04, D5708–10, D5727, i.e., 26 specimens). These specimens closely match a list of 27 specimens donated by SPENCER in 1895 (MCCOY 1896), and the dates are considered accurate. Hence this material was available for the HORN Report.

Similarly, there are 17 non-type specimens (D3264–66, D3427, D3501–03, D3542–43, D3557, D3559, D3567, D3583, D3601, D5705–07) with dates in 1897 and locality central Australia, which closely correspond to the list of central Australian specimens donated by SPENCER in 1897 (MCCOY 1898). The other central Australian specimens donated by SPENCER in 1897 are identified as

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HORN Expedition types in this list, and the rest of this material is likewise treated as potentially HORN Expedition. Several specimens fit unique HORN Expedition specimens of those species. The data for two other specimens, D3313–14 (central Australia, HORN, 1897), agree with the two specimens of "*Rhodona gerrardii*" GRAY, 1864 listed by MCCOY (1898) as donated by HORN in 1897, although I am unable to identify five *Gehyra variegata*, one *Tympanocryptis cephalus* GÜNTHER, 1867 and one *Menetia greyi* GRAY, 1845 donated by HORN in the same year.

A few other specimens are identified as from HORN, or HORN Expedition (D883, D3541, D3624) or are identified in the registers as types of HORN Expedition species (D7528, D7533, D7701, D9136, D11226, D10155–56, D11756–59, D11761)(see COVENTRY 1970, for the latter, with previous registration numbers).

A number of other individual specimens registered prior to D10000 also have localities commensurate with a HORN Expedition origin (Charlotte Waters, Alice Springs, Illamurta, Finke River, Palm Creek, or just central Australia), either with dates between 1896–97, or lacking any date, and may be HORN Expedition material, but only one (D540, *Strophurus ciliaris* complex, Mt Sonder, 1894, SPENCER) has a strong claim.

Finally, there are two series of more recent specimens, D12575–87 and D12676–91, which include 27 SPENCER specimens donated by the Melbourne University Zoology Department on 27.v.1968. These have localities Charlotte Waters and central Australia, and include some specimens which do not correspond to the limitations on numbers given in the HORN Report (e.g., three *Nephrurus amyae* COUPER, 1994, yet the HORN Report lists only two specimens of this species). Thus, at least some of this material is not from the HORN Expedition.

6. A REVISED LIST OF THE HERPETOLOGICAL COLLECTIONS OF THE HORN EXPEDITION

Although KERLE & FLEMING (1996) have attempted to update the nomenclature of most of the species listed in the HORN Report, they did not examine specimens, and their list is incorrect or incomplete in several respects. Hence, I provide a new list of the HORN Expedition collections, based in part on personal examination of the material. Species are listed in the order they are presented by SPENCER (1896c) and LUCAS & FROST (1896a), with the additional records from the Appendix (ANONYMOUS 1896) listed after each family. Species described in the HORN Report (or by LUCAS & FROST 1895b, 1897) are asterisked.

Amphibia

Cystignathidae (now Myobatrachidae)

1. *Limnodynastes ornatus* (Gray, 1842): Now *Limnodynastes spenceri* Parker, 1940, described from SPENCER material.
2. *Chiroleptes platycephalus* Günther, 1873: Now *Cyclorana platycephala* and the genus transferred to the family Hylidae.
3. *Chiroleptes brevipalmatus* Günther, 1876: Although SPENCER (1896c) reported the collection of eight specimens, none have been identified among the extant material. From the description provided, the species is probably *Cyclorana maini* Tyler & Martin, not described until 1977.
4. *Heleioporus pictus* (Peters, 1863): Material from SPENCER contributed to the description of *Neobatrachus centralis* (Parker, 1940). Recent studies (ROBERTS 1997) have suggested that this species is conspecific with *Neobatrachus sudelli* (Lamb, 1911).

Hylidae

5. *Hyla rubella* Gray, 1842: Now *Litoria rubella.*
*6. *Hyla gilleni* Spencer, 1896c: Now *Litoria gilleni.*

Reptilia

Geckonidae (now Gekkonidae)

1. *Nephrurus asper* Günther, 1876: Central Australian material formerly ascribed to this species was recently recognised as a new species, *N. amyae* Couper, 1994, by COUPER & GREGSON (1994).
2. *Nephrurus levis* de Vis, 1886: Although the plate in the HORN Report clearly shows *N. levis*, it is possible that an additional species was among the specimens (which numbered at least four, from the localities provided, though measurements of only three are given). AM R2105, MV D883, D3542 are *N. levis*, D3543 is identified in the registers as *N. vertebralis* Storr, 1963, a species not known from areas visited by SPENCER (and possibly misidentified; I have not examined this specimen), and a later SPENCER specimen, D2603 (Alice Well, v.1923) is *N. laevissimus* Mertens, 1958. The identification of BMNH 97.1.20.1, listed in registers as *N. levis*, has not been checked. Recognition of *N. laevissimus* as distinct from *N. levis* was delayed until the 1950s.
3. *Rhynchoedura ornata* Günther, 1867: No change. Only one specimen was obtained, which has not been identified among extant collections.
*4. *Ceramodactylus damaeus* Lucas & Frost, 1896a: Now referred to the genus *Lucasium* by most authors, although there is evidence (KLUGE 1967) that this monotypic genus should be transferred to *Diplodactylus*. Although the original description was based on two specimens, the Appendix notes the receipt of several additional specimens, and there are a number of speci-

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mens of this species among SPENCER material. Also among the SPENCER collections are several specimens (AM R2146, MV D2270, both Charlotte Waters, and MV D1428, D2333, both central Australia) of *D. stenodactylus* Boulenger, 1896, a superficially very similar species (KLUGE 1967) not otherwise reported in the expedition report, which may have been confused with *Diplodactylus damaeus*. SPENCER was interested in *D. damaeus* because of the biogeographic anomaly of a central Australian species being assigned to the Arabian genus *Ceramodactylus* (MULVANEY et al. 2000: 207). He encouraged BYRNE to collect additional material (MULVANEY et al.. 2000: 281; letter of 6.i.1896); BYRNE had asked the local aboriginals to search for them as early as December 1895 (MULVANEY et al.. 2000: 225), and reported sending material on 6.ii.1896 (MULVANEY et al.. 2000: 228).

5. *Heteronota binoei* Gray, 1845: Generic name now emended to *Heteronotia*.

*6. *Ebenavia horni* Lucas & Frost, 1895b: now *Crenadactylus ocellatus horni*.

7. *Diplodactylus ciliaris* Boulenger, 1885: Now placed by many in the genus *Strophurus*. The *S. ciliaris* complex in central Australia consists of more than one species (R. SADLIER, Sydney, pers. comm., 2002), the taxonomy of which is yet to be resolved (see STORR 1988, for resolution of the Western Australian species). Two of the three specimens from the HORN Expedition are probably MV D540 and D3503.

*8. *Diplodactylus byrnei* Lucas & Frost, 1896a: No change.

9. *Gehyra variegata* (Duméril & Bibron, 1839): Although at least some of the material is of this species, the plate clearly shows a member of the *G. punctata* (Fry, 1914) complex, of which *G. montium* Storr, 1982 is the only described species from localities visited by the HORN Expedition. Some possible HORN Expedition material in the Museum of Victoria is also of the *G. punctata* complex (D261, D266, D268). It is also possible that the HORN Expedition material includes *G. purpurascens* Storr, 1982 (e.g., ZMB 13360, which on superficial examination appears to be this species), as this species has not been separated from *G. variegata* in many institutional collections. Neither *G. montium* nor *G. purpurascens* was recognised as distinct until 1982.

Appendix, a: *Diplodactylus tesselatus* (Günther, 1875): No change.

*Appendix, b: *Diplodactylus conspicillatus* Lucas & Frost, 1897: No change.

Appendix, c: *Oedura tyroni*: Misspelling of *O. tryoni* de Vis, 1884. This species does not occur in central Australia, and the material reported, from Alice Springs, is presumably one of the several color varieties of *O. marmorata* Gray, 1842. Among the SPENCER material in the Museum of Victoria are three specimens (D3427, D12676–77) labelled *O. tryoni* from central Australia. I have not had the opportunity to check the identifications of these specimens.

Appendix, d: *Oedura marmorata* Gray, 1842: No change.

Pygopodidae

10. *Delma fraseri* Gray, 1831: The single "young" specimen from Alice Springs is possibly *Delma borea* Kluge, 1974 (MV D174, collected later by SPENCER from the same locality, is this species), *D. tincta* de Vis, 1884 or *D. nasuta* Kluge, 1974 all of which occur in the area (SHEA 1991). The only *Delma* specimen identified among the extant HORN Expedition material is AMNH 29, a *D. australis* Kluge, 1974 from Central Australia. The latter species does not occur at Alice Springs, but does occur in the region covered by the early part of the expedition (SHEA 1991). All four species were only recognised as distinct from *D. fraseri* in 1974.

11. *Lialis burtonis* Gray, 1835: No change.

*Appendix, e: *Ophidiocephalus taeniatus* Lucas & Frost, 1897: No change.

Agamidae

12. *Amphibolurus maculatus* (Gray, 1831): Now *Ctenophorus isolepis gularis* (Sternfeld) not described until 1925.

13. *Amphibolurus imbricatus* Peters, 1876: Now *Ctenophorus caudicinctus slateri* (Storr) not described until 1967.

14. *Amphibolurus reticulatus* (Gray, 1845): Now in the genus *Ctenophorus*. Among the numerous specimens originally identified as this species in HORN Expediton collections are specimens of both true *Ctenophorus reticulatus* (e.g., MV D445, D514–20) and the larger *Ctenophorus nuchalis* (de Vis, 1884) (e.g., MV D217, D219–20, D495–96). These two species were not confirmed as being distinct until 1966 (STORR 1966).

15. *Amphibolurus pictus* Peters, 1866: Now *Ctenophorus pictus*.

16. *Amphibolurus barbatus* (Cuvier, 1829): Two species in this complex are now recognised from central Australia, although the more common is *Pogona vitticeps* (Ahl, 1926), which is represented among the HORN material. WITTEN (1994) identified two specimens of *P. minor* (Sternfeld, 1919) (MV D493–94) among the subsequent material from Illamurta collected by COWLE and donated by SPENCER (although assigning individuals from this single locality to two different subspecies!), and it is possible that the HORN Expedition *Pogona* also included this species. Neither species was described until after the report.

17. *Tympanocryptis lineata* Peters, 1863: Species boundaries in this genus are currently being revised (HOUSTON & HUTCHINSON 1998). LUCAS & FROST

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(1895b) described *T. tetraporophora* from two specimens. In the subsequent report, LUCAS & FROST (1896a) repeated their formal description, but noted the receipt of eight specimens from the same area which they assigned to *T. lineata*, apparently on colour pattern, but which had the extra pair of pores of *T. tetraporophora*. On the basis of these additional specimens, they regarded the two species as only varietally distinct. However, subsequent work indicates that only *T. tetraporophora*, which shows much variation in colour pattern, from muted to strong, occurs in the region from which SPENCER's specimens came (HOUSTON & HUTCHINSON 1998), and therefore the specimens listed as *T. lineata* are *T. tetraporophora* Lucas & Frost, 1895b.

18. *Tympanocryptis cephalus* Günther, 1867: The single specimen listed from Oodnadatta belongs to an isolated population which is only tentatively retained in this species, pending further work (HOUSTON & HUTCHINSON 1998).

*19. *Tympanocryptis tetraporophora* Lucas & Frost, 1895b: No change.

*20. *Diporiphora winneckei* Lucas & Frost, 1896a: No change.

21. *Physignathus longirostris* (Boulenger, 1883): Now placed in either *Lophognathus* or *Amphibolurus*.

22. *Moloch horridus* Gray, 1841: No change.

Varanidae

23. *Varanus giganteus* (Gray, 1845): No change. The single specimen is presumably MV D3559.

24. *Varanus gouldii* (Gray, 1838): No change.

25. *Varanus punctatus* (Gray, 1838): now *Varanus tristis* (Schlegel, 1839).

26. *Varanus acanthurus* Boulenger, 1885: No change.

*27. *Varanus gilleni* Lucas & Frost, 1895b: No change. Although described from two specimens collected during the HORN Expedition, SPENCER was sent additional material of this species by BYRNE (MULVANEY et al.. 2000: 225, BYRNE letter of 20.xii.1895; MULVANEY et al.. 2001: 91, GILLEN letter of 20.xii.1895) and by GILLEN (MULVANEY et al. 2001: 152, GILLEN letter of 23.iii.1897), although only the former could have reached SPENCER in time for the HORN Expedition report.

*28. *Varanus eremius* Lucas & Frost, 1895b: No change. Described from a single specimen, additional material of this species was sent by BYRNE in December 1895 (MULVANEY et al.. 2000: 225) and GILLEN in March 1897 (MULVANEY et al. 2001: 152).

Scincidae

29. *Egernia whitii* (Lacépède, 1804): LUCAS & FROST (1896a) describe several discrete "variations" in coloration, and illustrate two of these. Of the specimens illustrated, Plate 11 fig. 3 is now *Egernia slateri virgata* Storr, 1968 while fig. 4 is *Egernia inornata* Roscn, 1905. Among the HORN Expedition material in the Natural History Museum, London, are four specimens labelled "*Egernia whitii*" (97.1.20.16–19). These four specimens represent four taxa: respectively *E. slateri slateri* Storr, 1968, *E. margaretae* Storr, 1968, *E. slateri virgata* and *E. inornata* (Fig. 3). *Egernia slateri virgata* has previously been known only from the two types, one of which (MV D273) is also probably a HORN Expedition specimen. Unfortunately, this third specimen, like the others, lacks a precise locality. Of the four taxa represented in the HORN Expedition collections, *E. inornata* was described in 1905, while the other three were not described until 1968.

Fig. 3: Horn Expedition specimens of the *Egernia whitii* species-group in the Natural History Museum, London. From left to right: *Egernia slateri slateri* (97.1.20.16), *Egernia margaretae* (97.1.20.17), *Egernia slateri virgata* (97.1.20.18) and *Egernia inornata* (97.1.20.19).

30. *Egernia stokesii* (Gray, 1845): No change. KERLE & FLEMING (1996) suggested that the identification of this species provided by LUCAS & FROST (1896a) was erroneous, and that the species was one of the *E. whitii* species-group members, either *E. margaretae* or *E. slateri*. They based their argument on the unsuitability of the habitat at the cited locality (Oodnadatta). However, not only is it unlikely that two experienced herpetologists could confuse the spiny, short-tailed *E. stokesii* with the smooth, long-tailed *whitii*-group species, but there is at least one *E. stokesii* among the possible HORN Expedition material (MV D272). Although the open stony plains at Oodnadatta are not typical habitat for this species, it does occur in low numbers in similar habitats in north-western New South Wales, where it inhabits dead eucalypts and acacias associated with drainage channels.

31. *Tiliqua occipitalis* (Peters, 1863): From the description provided by LUCAS & FROST (1896a), both specimens collected are *Tiliqua multifasciata* Sternfeld, 1919. Two specimens, one in London (97.1.20.20) and one in New York (1203) are identifiable as the latter species, not described until 1919.

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32. *Hinulia lesueurii* (Duméril & Bibron, 1839): Now in the genus *Ctenotus*. The specimens of *Ctenotus* collected by the Horn Expedition are now identifiable as belonging to at least seven species: *C. alacer* Storr, 1969 (e.g., MV D277), *C. brooksi aranda* Storr, 1969 (e.g., MV D199, D207, AMNH 1201), *C. leonhardii* (Sternfeld, 1919) (e.g., MV D271, D274, BMNH 97.1.20.22, AMNH 1199), *C. quattuordecimlineatus* (Sternfeld, 1919) (MV D281), *C. saxatilis* Storr, 1969 (e.g., BMNH 97.1.20.21, AMNH 1200, 1202), *C. schomburgkii* (Peters, 1863) (e.g., MV D279, BMNH 97.1.20.23) and *C. strauchii varius* Storr, 1981 (e.g., MV D280, D946, AM R2094). Recognition of the species diversity in desert *Ctenotus* did not occur until the 1960s.

33. *Hinulia fasciolata* Günther, 1867: Now in the genus *Eremiascincus*. Both *E. fasciolatus* and *E. richardsoni* (Gray, 1845) are present among the HORN Expedition collections, although the distinction between the two species was not confirmed until 1974.

*34. *Rhodona tetradactyla* Lucas & Frost, 1895b: Now *Lerista frosti* (Zietz, 1920), a replacement name necessary because of the homonymy caused when the species was at one stage transferred to *Lygosoma*.

35. *Rhodona gerrardii* Gray, 1864: Now *Lerista desertorum* (Sternfeld), a species not described until 1919, and not generally recognised until 1971.

36. *Rhodona bipes* Fischer, 1882: Now in the genus *Lerista*, but the specimens could be either *Lerista bipes* or *L. labialis* Storr, 1971, both of which occur in broad sympatry in the area (HORNER 1991). No specimens have been located to verify the identification.

37. *Ablepharus boutonii* (Desjardin, 1831): Now *Cryptoblepharus plagiocephalus* (Cocteau, 1836). Curiously, while only a single specimen, from Palm Creek, was reported by LUCAS & FROST (1896a), the only located specimen is from Camp 23 (D283), which is at Illamurta.

38. *Ablepharus lineo-ocellatus* (Duméril & Bibron, 1839): Now *Morethia*, probably *M. boulengeri* (Ogilby, 1890), which is the only *Morethia* other than *M. ruficauda* occurring in the southern Northern Territory (HORNER 1991). Although there are three specimens of *M. adelaidensis* (Peters, 1874) (MV D1181, D1183–84) among possible HORN Expedition collections, only two specimens of *A. lineo-ocellatus* were reported in the Report, casting further doubt over the identification of these specimens and the block of specimens to which they belong as being from the expedition (see also p. 261, above).

*39. *Ablepharus lineo-ocellatus* var. *ruficaudus* Lucas & Frost, 1895b: Now *Morethia ruficauda ruficauda*. Spencer (1896a: 26) referred to this taxon as *Ablepharus ruficaudatus*, an unjustified emendation and change in status.

40. *Ablepharus greyii* (Gray, 1845): Now *Menetia greyii*.

Appendix, f: *Ablepharus elegans* (Gray, 1845): Although no specimen has been located to confirm the identification, the combination of features given (like *elegans*, but with 18 midbody scales, and the dorsal scales with a central black dot) suggest that the species is *Lerista xanthura* Storr, which has the two latter features and is tetradactyle like *elegans*. *Lerista xantlura* was not described until 1976.

Typhlopidae

Appendix, g: *Typhlops polygrammicus* (Schlegel, 1839): Probably *Ramphotyphlops endoterus* (Waite, 1918), yet to be described at the time. One specimen of the latter is among the SPENCER collections (MV D1962, Charlotte Waters), agreeing with one of the localities given. The record from Alice Springs is also most likely to be the same species. Although two other species, *R. bituberculatus* (Peters, 1863) and *R. diversus* (Waite, 1894), are among SPENCER collections from Alice Springs (D1941, D1944, both xii.1896), it is unlikely that SPENCER or FROST (LUCAS was probably too far away to have seen the later specimens reported in the Appendix) would have confused the very distinctive lobed snout of *R. bituberculatus* with *R. polygrammicus*, while *R. diversus* has only 20 midbody scales, fewer than *R. polygrammicus* and *R. endoterus* (both 22). CALABY (1996) notes that the Alice Springs typhlopid listed in the HORN Report was sent by GILLEN on 31.i.1896.

Boidae

41. *Liasis childreni* Gray, 1842: Now *Antaresia stimsoni orientalis* (Smith), not described until 1985.

42. *Python spilotes* (Lacépède, 1804): The single specimen collected is now *Morelia spilota bredli* (Gow), not described until 1981.

43. *Aspidites melanocephalus* (Krefft, 1864): From the colouration description, this specimen is *Aspidites ramsayi* (Macleay, 1882).

Elapidae

44. *Diemenia reticulata* (Gray, 1842): Now *Demansia reticulata cupreiceps* Storr, a subspecies not described until 1978.

45. *Pseudonaja nuchalis* Günther, 1858: Unchanged.

46. *Pseudonaja affinis* Günther, 1872: The specimen has not been located, and the morphological data (21 midbody scale rows) do not fit any *Pseudonaja* species occurring in the vicinity of the locality cited (Reedy Creek). Although this count is typical of Northern Territory *Pseudonaja guttata* (Parker, 1926), that species does not occur in the southern Northern Territory (GILLAM 1979). The only species of snake occurring in this

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region which may have 21 midbody scales is *Suta suta* (Peters, 1863), a species which LUCAS & FROST (1896a) described under the name *Hoplocephalus stirlingi*. Consequently, the identity of this record remains a mystery.

47. *Pseudechis australis* (Gray, 1842): Of the two specimens described, the first is undoubtedly *P. australis*. However, the second specimen, which had only a single anterior temporal and most of the subcaudals paired, may have been *Pseudonaja textilis* (Duméril, Bibron & Duméril, 1854), although the specimen cannot be located for confirmation.

48. *Furina ramsayi* Macleay, 1885: Now *Pseudonaja modesta* (Günther, 1872).

49. *Vermicella annulata* (Gray, 1841): The description of colouration as "bright orange" suggests that the single specimen was *Simoselaps anomalus* (Sternfeld), which was not described until 1919.

*50. *Hoplocephalus stirlingi* Lucas & Frost, 1896a: Now *Suta suta* (Peters, 1863).

*51. *Hornea pulchella* Lucas & Frost, 1896a: Now *Simoselaps fasciolatus fasciata* (Stirling & Zietz, 1893). It is curious that LUCAS & FROST (1896a) did not recognise that they had described the same taxon as described by STIRLING & ZIETZ (1893) from the ELDER Expedition of 1891–92, particularly when a clear illustration of the latter species was included in the description, and STIRLING was a member of the HORN Expedition. It is possibly an indicator that ZIETZ, not STIRLING, did most of the work in preparing the herpetological results of the ELDER Expedition.

52. *Acanthophis antarcticus* (Shaw & Nodder, 1802) [as WAGLER]: Now *Acanthophis pyrrhus* Boulenger, 1898, described only two years after the report.

Of the 65 reptile and amphibian species recorded in the HORN Expedition Report, 14 were described as new, of which all except the two snakes are still recognised. The high success rate in recognition of new species is probably mostly a reflection of the previous lack of collections from the areas surveyed, although it is curious that there was not more overlap with the results of the ELDER Expedition, which collected to the west and south. That expedition collected 42 species of reptiles and amphibians, six described as new, all of which are still considered distinct. However, based on the author's reidentifications of the ELDER Expedition collection, only 17 species were collected by both expeditions.

Despite the number of new species still recognised from the HORN Expedition, it is now evident that the species diversity and discovery of new species by the expedition was much greater than immediately apparent from the report. On the basis of this study, the HORN Expedition collected 78 species, of which 39 (50%) were yet to be described at the time of collection.

7. THE CONTINUING VALUE OF THE HERPETOLOGICAL COLLECTIONS OF THE HORN EXPEDITION AND BALDWIN SPENCER

Although the HORN Expedition collections were described by LUCAS & FROST (1896a), their value as representative collections from central Australia persists. A number of subsequent taxonomic revisions have used non-type specimens from these collections, sometimes without recognising this. In several cases, HORN/SPENCER material has subsequently been nominated as type material of new species.

The myobatrachid frogs in the HORN and SPENCER collections in the Natural History Museum (London) were used by PARKER (1940), who described *Limnodynastes spenceri* (holotype BMNH 97.10.27.68, paratypes BMNH 97.10.27.60–67) and *Neobatrachus centralis* (paratypes BMNH 97.1.20.32–33) from among them.

Of the gecko material, the paratypes of *Nephrurus amyae* Couper (in COUPER & GREGSON 1994) include SPENCER material (MV D12684–85), while there are several *Diplodactylus* specimens in the AM, AMNH, MV and BMNH collections that were examined by KLUGE (1967).

Pygopods from the 1896 Alice Springs collection and the HORN Expedition in the Museum of Victoria (D169–74) and the American Museum of Natural History (29) were examined by KLUGE (1974). Until recently, the holotype of *Ophidiocephalus taeniatus* remained the only specimen known of this monotypic genus, although it has since been rediscovered at several sites (EHMANN & METCALFE 1978; EHMANN 1981; DOWNES et al. 1997).

Among agamids, the 1896 Alice Springs *Lophognathus* material among SPENCER's later collections in the Museum of Victoria was listed by STORR (1974a), who largely based his redescription of *Lophognathus gilberti centralis* on them, while HOUSTON (1977) examined two SPENCER *Diporiphora winneckei* specimens (AM R2143–45). STORR (1974a) also nominated two Charlotte Waters specimens (MV D2691, D2695) from the 1901–02 SPENCER-GILLEN Expedition as paratypes of *Diporiphora lalliae*. MITCHELL (1948) examined HORN/SPENCER *Tympanocryptis* material in the Australian Museum and Museum of Victoria for his revision of the genus.

The HORN/SPENCER skink collections have received the greatest attention in subsequent studies (not surprisingly, given the number of new skinks described from central Australia in the last three decades). The concept of a single variable species *Hinulia lesueurii* was exploded by STORR's revisions of the genus *Ctenotus*, which now numbers over 90 species. HORN and SPENCER specimens (including some from later expedi-

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tions) have become paratypes of *Ctenotus alacer* Storr, 1969 (MV D202–03, D208, D277), *C. saxatilis* STORR, 1969 (MV D167, D198, D205, D469, D2070) and *C. strauchii varius* Storr, 1981 (AM R2094, MV D280), while other material collected or donated by SPENCER has been subsequently reidentified as *C. brooksi aranda*, *C. leonhardii*, *C. quattuordecimlineatus* and *C. schomburgkii* (STORR 1969, 1971, 1980). Similarly, STORR (1968) distinguished six species and subspecies of the *Egernia whitii* species-group in central Australia. One of the 1896 central Australian specimens, MV D273, is the only paratype of *Egernia slateri virgata* Storr, 1968, a subspecies of uncertain distribution – no precise localities are associated with either of the types, and no more recent material has come to light (but see above). HORN/SPENCER specimens of *Eremiascincus* and *Morethia* in the Museum of Victoria have also been examined by STORR (1974b) and RAWLINSON (1976) respectively.

Among the few snakes reported by the expedition, SMITH (1985) nominated MV D3601 as a paratype of the python *Liasis stimsoni orientalis*.

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LITERATURE

ANONYMOUS (1896): Supplement to the Zoological Report. Additions to the Fauna. Pp. 210–211 in: SPENCER, [W.]B. (ed.) Report on the Work of the Horn Scientific Expedition to Central Australia. Part I. – Introduction, Narrative, Summary of Results, Supplement to Zoological Report, Map. Dulau & Co., London and Melville, Mullen & Slade, Melbourne.

ANONYMOUS (1899a): Lost on Mount Kosciusko. An Australian alpine incident. Mr A. H. Lucas missing. Search parties out. Daily Telegraph (Sydney) **14.i.1899**: 9.

ANONYMOUS (1899b): The Australian alpine incident. Mr Lucas found. Now at the Observatory. Daily Telegraph (Sydney) **16.i.1899**: 6.

ANONYMOUS (1915): The late Mr. Charles Frost, F.L.S. Victorian Naturalist **32**: 86.

ANONYMOUS (1929): List of papers by the late J.J. Fletcher. Proceedings of the Linnean Society of New South Wales **54**: 686–687.

ANONYMOUS (1981): Death of former police reporter. Sydney Morning Herald **21.viii.1981**: 8.

APLIN, K.P. & ADAMS, M. (1998): Morphological and genetic discrimination of new species and subspecies of gekkonid and scincid lizards (Squamata: Lacertilia) from the Carnarvon Basin region of Western Australia. Journal of the Royal Society of Western Australia **81**: 201–223.

BLANCHARD, F.N. (1929): Re-discovery of *Crinia tasmaniensis*, with notes on this and other Tasmanian frogs. Australian Zoologist **5**: 324–328.

BOULENGER, G.A. (1885–1887): Catalogue of the Lizards in the British Museum (Natural History). 3 Vols. Trustees of the British Museum, London. xii + 436 pp., 32 pls.; xiii + 497 pp., 24 pls.; xii + 575 pp., 40 pls.

BOULENGER, G.A. (1888): Descriptions of two new Australian frogs. Annals and Magazine of Natural History (6)**2**: 142–143.

BOULENGER, G.A. (1890): Description of a new genus of cystignathoid frogs from New South Wales. Proceedings of the Linnean Society of New South Wales (2)**5**: 593–594.

BOULENGER, G.A. (1893): Description of a new tree frog from New South Wales. Proceedings of the Linnean Society of New South Wales (2)**7**: 403.

BRANAGAN, D.F. (1996): John Alexander Watt: geologist on the Horn Expedition. Pp. 42–58 in: MORTON, S.R. & MULVANEY, D.J. (eds.), Exploring Central Australia: Society, the Environment and the 1894 Horn Expedition. Surrey Beatty & Sons, Chipping Norton.

BROWN, J.M. (1983): Horn, William Austin. Australian Dictionary of Biography **9**: 367–369.

CALABY, J.H. (1966): Mammals of the Upper Richmond and Clarence Rivers, New South Wales. CSIRO Division of Wildlife Research Technical Paper (**10**): 1–55.

CALABY, J.H. (1996): Baldwin Spencer's post-Horn Expedition collectors in central Australia. Pp. 188–208 in: MORTON, S.R. & MULVANEY, D.J. (eds.) Exploring Central Australia: Society, the Environment and the 1894 Horn Expedition. Surrey Beatty & Sons, Chipping Norton.

CARTER, H.J. (1937a): Arthur Henry Shakespeare Lucas 1853–1936. Proceedings of the Linnean Society of New South Wales **62**: 243–252 + pl. xii.

CARTER, H.J. (1937b): Arthur Henry Shakespeare Lucas, M.A. (Oxon. and Melb.). Australian Naturalist **10**: 7–10.

CHRISTIAN, T. (1977): Notes on Centralian Bluetongues (Tiliqua Multifasciata [sic]). Newsletter of the Victorian Herpetological Society (**1**): 8–9.

COGGER, H.G., CAMERON, E.E. & COGGER, H.M. (1983): Zoological Catalogue of Australia. Vol. 1. Amphibia & Reptilia. Australian Government Publishing Service, Canberra. vi + 313 pp.

COUPER, P.J. & GREGSON, R.A.M. (1994): Redescription of *Nephrurus asper* Günther, and description of *N. amyae* sp. nov. and *N. sheai* sp. nov. Memoirs of the Queensland Museum **37**: 67–81.

COVENTRY, A.J. (1970): Reptile and amphibian type specimens housed in the National Museum of Victoria. Memoirs of the National Museum of Victoria **31**: 115–124.

DAKIN, W.J. (1920): Notes on the habits and reproduction of the Great Western Burrowing Frog, *Heleioporus albopunctatus*. Australian Zoologist **1**: 241–244.

DENDY, A. (1889): The anatomy of an Australian land planarian. Transactions of the Royal Society of Victoria **1**: 50–95 + pl. 7–10.

DENDY, A. (1890): On the Victorian Land Planarians. Transactions of the Royal Society of Victoria **2**: 65–80 + pl. 7.

DENDY, A. (1899a): Outlines of the Development of the Tuatara, *Sphenodon* (*Hatteria*) *punctatus*. Quarterly

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Journal of Microscopical Science (new series) **42**: 1–87 + pl. 1–10.

DENDY, A. (1899b): On the Development of the Parietal Eye and Adjacent Organs in *Sphenodon* (*Hatteria*). Quarterly Journal of Microscopical Science (new series) **42**: 111–153 + pl. 11–13.

DENDY, A. (1909): The Intracranial Vascular System of *Sphenodon*. Philosophical Transactions of the Royal Society Series B **200**: 403–426 + pl 31.

DENDY, A. (1910): On the structure, development and morphological interpretation of pineal organs and adjacent parts of the brain in the tuatara (*Sphenodon punctatus*). Anatomischer Anzeiger **37**: 453–462.

DENDY, A. (1911): On the Structure, Development and Morphological Interpretation of Pineal Organs and Adjacent Parts of the Brain in the Tuatara (*Sphenodon punctatus*). Philosophical Transactions of the Royal Society Series B **201**: 227–331 + pl. 19–31.

DONOVAN, K. (1938): A great educator. Australian Quarterly **10**: 77–80.

DOWNES, S., FOSTER, R. & MOLNAR, C. (1997): New insights into the distribution and habitat of the vulnerable Bronzeback Legless Lizard *Ophidiocephalus taeniatus*. Herpetofauna **27**(1): 11–13.

DUCKER, S.C. (1986): Lucas, Arthur Henry Shakespeare. Australian Dictionary of Biography **10**: 163–164.

DUCKER, S.C. (1998): An Early Overland Expedition to Wilsons Promontory. Victorian Naturalist **115**: 292–295.

EAKIN, R.M. (1973): The Third Eye. University of California Press, Berkeley. xi + 157 pp.

EHMANN, H. (1981): The Natural History and Conservation of the Bronzeback (*Ophidiocephalus taeniatus* Lucas and Frost)(Lacertilia, Pygopodidae). Pp. 7–13 in: BANKS, C.B. & MARTIN, A.A. (eds.) Proceedings of the Melbourne Herpetological Symposium. Zoological Board of Victoria, Melbourne.

EHMANN, H. & METCALFE, D. (1978): The rediscovery of *Ophidiocephalus taeniatus* Lucas and Frost (Pygopodidae, Lacertilia) the Bronzeback. Herpetofauna **9**(2): 8–10.

ENGLISH, T.M.S. (1910): Some Notes on Tasmanian Frogs. Proceedings of the Zoological Soiety of London **1910**: 627–634 + pl. li.

FERGUSON, E.W. (1927): Presidential address. Proceedings of the Linnean Society of New South Wales **52**: i–xxviii.

FINNEY, C.M. (1984): To Sail Beyond The Sunset. Natural History in Australia 1699–1829. Rigby, Adelaide. x + 206 pp.

FLETCHER, J.J. (1882): On the existence after parturition of a direct communication between the median vaginal cul-de-sac, so-called, and the urogenital canal, in certain species of kangaroos. Proceedings of the Linnean Society of New South Wales **6**: 796–811.

FLETCHER, J.J. (1883a): On some points in the anatomy of the urogenital organs in females of certain species of kangaroos. – Part I. Proceedings of the Linnean Society of New South Wales **7**: 640–659.

FLETCHER, J.J. (1883b): On some points in the anatomy of the urogenital organs in females of certain species of kangaroos. – Part II. Proceedings of the Linnean Society of New South Wales **8**: 6–11.

FLETCHER, J.J. (1883c): Note on a Viviparous Lizard (*Hinulia elegans*.). Proceedings of the Linnean Society of New South Wales **8**: 215–217.

FLETCHER, J.J. (1884): Catalogue of papers and works relating to the mammalian orders, Marsupialia and Monotremata. Proceedings of the Linnean Society of New South Wales **9**: 809–863.

FLETCHER, J.J. (1889): Observations on the oviposition and habits of certain Australian batrachians. Proceedings of the Linnean Society of New South Wales (2)**4**: 357–387.

FLETCHER, J.J. (1891a): Contributions to a more exact knowledge of the geographical distribution of Australian Batrachia. No. I. Proceedings of the Linnean Society of New South Wales (2)**5**: 667–676.

FLETCHER, J.J. (1891b): Description of a supposed new cystignathoid frog. Proceedings of the Linnean Society of New South Wales (2)**6**: 275–276.

FLETCHER, J.J. (1891c): Contributions to a more exact knowledge of the geographical distribution of Australian Batrachia. No. II. Proceedings of the Linnean Society of New South Wales (2)**6**: 263–274.

FLETCHER, J.J. (1892): Contributions to a more exact knowledge of the geographical distribution of Australian Batrachia. No. III. Proceedings of the Linnean Society of New South Wales (2)**7**: 7–19.

FLETCHER, J.J. (1894a): Contributions to a more exact knowledge of the geographical distribution of Australian Batrachia. No. IV. Proceedings of the Linnean Society of New South Wales (2)**8**: 524–533.

FLETCHER, J.J. (1894b): Description of a new cystignathoid frog from New South Wales. Proceedings of the Linnean Society of New South Wales (2)**8**: 229–236.

FLETCHER, J.J. (1894c): Description of a new cystignathoid frog from New South Wales. Proceedings of the Linnean Society of New South Wales (2)**8**: 522–523.

FLETCHER, J.J. (1898): Contributions to a more exact knowledge of the geographical distribution of Australian Batrachia. No. V. Proceedings of the Linnean Society of New South Wales **22**: 660–684.

FLYNN, T.T. (1923): On the occurrence of a true allantoplacenta of the conjoint type in an Australian lizard. Records of the Australian Museum **14**: 72–77.

FRENCH, C. & FROST, C. (1894): Excursion to Warrandyte. Victorian Naturalist **10**: 187–189.

FROST, C. (1888): Experiments with the Victorian "Katipo". Victorian Naturalist **5**: 56–57.

[FROST, C.] (1889): [untitled bird list]. In: [W.]B. SPENCER & C. FRENCH, Trip to Croajingolong. Victorian Naturalist **6**: 33–34.

FROST, C. (1890): Notes on the habits and senses of spiders. Part I. Victorian Naturalist **6**: 147–152. [second part presented at May 1894 meeting, but not published]

FROST, C. (1891): Notes on the poisonous bite of *Latrodectus scelio*. Victorian Naturalist **7**: 140–143.

FROST, C. (1894a): Reptilia. In: J. GABRIEL, Report of expedition to Furneaux Group. Victorian Naturalist **10**: 183.

FROST, C. (1894b): Lizards. In: D. LE SOUEF, A trip to North Queensland. Victorian Naturalist **11**: 29.

FROST, C. (1895): On a snake new for Victoria. Victorian Naturalist **11**: 146–147.

FROST, C. & LUCAS, A.H.S. (1894): On a new skink lizard from Tasmania. Proceedings of the Linnean Society of New South Wales (2)**8**: 227–228.

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GILLAM, M.W. (1979): The genus *Pseudonaja* (Serpentes: Elapidae) in the Northern Territory. Territory Parks and Wildlife Commission Research Bulletin (**1**): 1–28.

GILRUTH, J.A., SWEET, G. & DODD, S. (1910): Notes on Blood Parasites. Proceedings of the Royal Society of Victoria (new series)**23**: 231–241.

GRAY, J.E. (1845): Catalogue of the specimens of lizards in the collection of the British Museum. Edward Newman, London. xxviii + 289 pp.

GÜNTHER, A. (1858): Catalogue of colubrine snakes in the collection of the British Museum. British Museum, London. xvi + 281 pp.

HAACKE, W. (1883): Zur Naturgeschichte der Stummelschwanzeidechsen. Der Zoologischer Garten **24**: 225–227.

HAACKE, W. (1885): Über eine neue Art uterinaler Brutpflege bei Reptilien. Zoologischer Anzeiger **8**: 435–439.

HARRISON, L. (1921): Note on the pigmentation of frogs' eggs. Proceedings of the Linnean Society of New South Wales **46**: 370–373.

HARRISON, L. (1922): On the breeding habits of some Australian frogs. Australian Zoologist **3**: 17–34.

HARRISON, L. (1927): Notes on some Western Australian frogs, with descriptions of new species. Records of the Australian Museum **15**: 277–287.

HARRISON, L. & WEEKES, H.C. (1925): On the occurrence of placentation in the scincid lizard *Lygosoma entrecasteauxi*. Proceedings of the Linnean Society of New South Wales **50**: 470–486.

HORNER, P. (1991): Skinks of the Northern Territory. Northern Territory Museum, Darwin. 174 pp.

HOUSTON, T.F. (1977): A new species of *Diporiphora* from South Australia and geographic variation in *D. winneckei* Lucas & Frost (Lacertilia: Agamidae). Transactions of the Royal Society of South Australia **101**: 199–206.

HOUSTON, T.[F.] & HUTCHINSON, M. (1998): Dragon Lizards and Goannas of South Australia (2nd Edn.). South Australian Museum, Adelaide. 87 pp.

HOWITT, A.W., LUCAS, A.H.S. & DENDY, A. (1891): A visit to Lake Nigothoruk and the Mount Wellington district, Gippsland. Victorian Naturalist **8**: 17–42.

KELLAWAY, C.H. & EADES, T. (1929): Further notes on the common Australian venomous snakes. Medical Journal of Australia **1929(2)**: 249–257.

KERLE, J.A. & FLEMING, M.R. (1996): A history of vertebrate fauna observations in central Australia: their value for conservation. Pp. 341–366 in: MORTON, S.R. & MULVANEY, D.J. (eds.), Exploring Central Australia: Society, the Environment and the 1894 Horn Expedition. Surrey Beatty & Sons, Chipping Norton.

KERSHAW, J.A. (1901): Schedule A. Donations to the National Museum for the Year 1900. Pp. 34–38 in: Report of the Trustees of the Public Library, Museums, and National Gallery of Victoria for 1900, with a statement of income and expenditure for the financial year 1899–1900. Government Printer, Melbourne.

KERSHAW, J.A. (1907): Schedule A. – Donations to the National Museum for the Year 1906. 2. – Specimens (Zoology). Pp. 35–38 in: Report of the Trustees of the Public Library, Museum, and National Gallery of Victoria, for 1906 with a statement of income and expenditure for the financial year 1905–6. Government Printer, Melbourne.

KINGHORN, J.R. (1921): Studies in Australian reptiles. No. 2. Records of the Australian Museum **13**: 143–154 + pl. xxv–xxvi.

KINGHORN, J.R. (1923): A new genus of elapine snake from north Australia. Records of the Australian Museum **14**: 42–45.

KINGHORN, J.R. (1924): Reptiles and batrachians from south and south-west Australia. Records of the Australian Museum **14**: 163–183.

KINGHORN, J.R. (1931): Herpetological notes. No. 2. Records of the Australian Museum **18**: 85–91.

KINGHORN, J.R. (1932): Herpetological notes. No. 4. Records of the Australian Museum **18**: 355–363.

KINGHORN, J.R. (1945): The Simpson Desert Expedition, 1939. Scientific Reports: No. 3, Biology – Reptiles and Batrachians. Transactions of the Royal Society of South Australia **69**: 3–9.

KLUGE, A.G. (1967): Systematics, phylogeny, and zoogeography of the lizard genus *Diplodactylus* Gray (Gekkonidae). Australian Journal of Zoology **15**: 1007–1108.

KLUGE, A.G. (1974). A taxonomic revision of the lizard family Pygopodidae. Miscellaneous Publications of the Museum of Zoology, University of Michigan **147**: 1–221.

KREFFT, G. (1863): On the Batrachians occurring in the Neighbourhood of Sydney, with Remarks upon their Geographical Distribution. Proceedings of the Zoological Society of London **1863**: 386–390.

KREFFT, G. (1866a): On the Vertebrated Animals of the Lower Murray and Darling, their habits, economy, and geographical distribution. Transactions of the Philosophical Society of New South Wales **1862–65**: 1–33.

KREFFT, G. (1866b): On Snakes Observed in the neighbourhood of Sydney. Transactions of the Philosophical Society of New South Wales **1862–65**: 34–60.

KREFFT, G. (1869): The Snakes of Australia; an illustrated and descriptive catalogue of all the known species. Government Printer, Sydney. xxv + 100 pp., 12 pls.

KREFFT, G. (1871): Australian Vertebrata – fossil and recent. Government Printer, Sydney. 96 pp.

LE SOUEF, D. (1888): Reptilia. In: A.J. CAMPBELL (ed.), Expedition to King Island, November, 1887. Victorian Naturalist **4**: 138–139.

LEONHARDI, M.F. VON (1907): Über einige religiöse und totemistische Vorstellungen der Aranda und Loritja in Zentralaustralien. Globus **91**: 285–290.

LISTER, J.J. & FLETCHER, J.J. (1882): On the Condition of the Median Portion of the Vaginal Apparatus in the Macropodidae. Proceedings of the Zoological Society of London **1881**: 976–996.

LOHE, M. (1977): A mission is established at Hermannsburg. Pp. 6–41 in: LESKE, E. (ed.) Hermannsburg: A Vision and a Mission. Lutheran Publishing House, Adelaide.

LONGMAN, H.A. (1916): Snakes and lizards from Queensland and the Northern Territory. Memoirs of the Queensland Museum **5**: 46–51 + pl. vi.

LONGMAN, H.A. (1918): Notes on some Queensland and Papuan reptiles. Memoirs of the Queensland Museum **6**: 37–44 + pl. xi.

LOVERIDGE, A. (1938): On some reptiles and amphibians from the central region of Australia. Transactions of the Royal Society of South Australia **62**: 183–191.

© Biodiversity Heritage Library, http://www.biodiversitylibrary.org/; www.zoologicalbulletin.de; www.biologiezentrum.at

LUCAS, A.H.S. (1890): Zoology: Vertebrata. Pp. 56–73 in: SPENCER, W.B. (ed.) Handbook of Melbourne. For the use of members of the Australasian Association for the Advancement of Science, Melbourne Meeting, 1890. Spectator Publishing Company, Melbourne.

LUCAS, A.H.S. (1892): Note on the Distribution of Victorian Batrachians with Descriptions of Two New Species. Proceedings of the Royal Society of Victoria (new series)**4**: 59–64.

LUCAS, A.H.S. (1897): On some Facts in the Geographical Distribution of Land and Fresh-water Vertebrates in Victoria. Proceedings of the Royal Society of Victoria (new series) **9**: 34–53.

LUCAS, A.H.S. (1898): Contributions to a knowledge of the fauna of British New Guinea No. I. i. Lacertilia and Batrachia. Proceedings of the Linnean Society of New South Wales **23**: 357–359.

LUCAS, A.H.S. (1914): The reptiles and amphibia. Pp. 314–321 in: British Association for the Advancement of Science, 1914. Handbook for New South Wales. New South Wales Committee and Edward Lee & Co., Sydney.

LUCAS, A.H.S. (1930): Joseph James Fletcher, an idealist secretary. Proceedings of the Linnean Society of New South Wales **55**: 738–750.

LUCAS, A.H.S. (1936): The Seaweeds of South Australia. Part 1. Introduction and the Green and Brown Seaweeds. Government Printer, Adelaide. 106 pp.

LUCAS, A.H.S. (1937): A.H.S. Lucas Scientist. His own story. Angus & Robertson, Sydney. frontispiece, xxxii + 198 pp.

LUCAS, A.H.S. & FROST, C. (1894): The Lizards indigenous to Victoria. Proceedings of the Royal Society of Victoria (new series) **6**: 24–92 + pl. II.

LUCAS, A.H.S. & FROST, C. (1895a): The lizards (Lacertilia) indigenous to New Zealand. Transactions of the New Zealand Institute **29**: 264–280.

LUCAS, A.H.S. & FROST, C. (1895b): Preliminary notice of Certain Species of Lizards from Central Australia. [incorrectly cited as "Preliminary notice of a certain species of lizard from central Australia" in many publications]. Proceedings of the Royal Society of Victoria (new series)**7**: 264–269.

LUCAS, A.H.S. & FROST, C. (1896a): Reptilia. Pp. 112–175 in: SPENCER, [W.]B. (ed.) Report on the work of the Horn Scientific Expedition to central Australia. Part II. – Zoology. Dulau & Co., London and Melville, Mullen & Slade, Melbourne.

LUCAS, A.H.S. & FROST, C. (1896b): Further Preliminary Notice of Certain New Species of Lizards from Central Australia. Proceedings of the Royal Society of Victoria (new series) **8**: 1–4.

LUCAS, A.H.S. & FROST, C. (1896c): Description of a new species of *Ablepharus* from Victoria, with critical notes on two other Australian lizards. Proceedings of the Linnean Society of New South Wales **21**: 281–283.

LUCAS, A.H.S. & FROST, C. (1897): Descriptions of two new Species of Lizards from Central Australia. Proceedings of the Royal Society of Victoria (new series) **9**: 54–56.

LUCAS, A.H.S. & FROST, C. (1900): Description of a New Lizard from Northern Queensland. Proceedings of the Royal Society of Victoria (new series) **12**: 145–146.

LUCAS, A.H.S. & FROST, C. (1901): A census of Australian lizards. Reports of the Australasian Association for the Advancement of Science **8**: 256–261.

LUCAS, A.H.S. & FROST, C. (1902): Descriptions of some new lizards from Western Australia. Proceedings of the Royal Society of Victoria (new series) **15**: 76–79.

LUCAS, A.H.S. & FROST, C. (1903): Description of two new Australian lizards, *Varanus spenceri* and *Diplodactylus bilineatus*. Proceedings of the Royal Society of Victoria (new series) **15**: 145–147.

LUCAS, A.H.S. & LE SOUEF, W.H.D. (1909): The Animals of Australia. Mammals, Reptiles and Amphibians. Whitcombe & Tombs, Melbourne. Frontispiece, xi + 327 pp.

LUCAS, A.H.S. & PERRIN, F. (1947): The Seaweeds of South Australia. Part II. The Red Seaweeds. Government Printer, Adelaide. 352 pp.

MACCALLUM, M. (1990): Sweet, Georgina. Australian Dictionary of Biography **12**: 149–150.

MACMILLAN, D.S. (1963): Newington College 1863–1963. Newington College and Halstead Press, Sydney. 168 pp.

MARSHALL, A.M. (1882): The Frog: an introduction to Anatomy and Histology. J.E. Cornish, Manchester and Smith, Elder & Co., London. iv + 86 pp.

MARSHALL, A.M. & SPENCER, W.B. (1881): Observations on the Cranial Nerves of *Scyllium*. Quarterly Journal of Microscopical Science (new series) **21**: 469–499.

M[C]'COY, F. (1867): On the Recent Zoology and Palaeontology of Victoria. Annals and Magazine of Natural History (3)**20**: 175–202.

MCCOY, F. (1896): Schedule A. Donations to the National Museum during the Year 1895. Pp. 30–31 in: Report of the Trustees of the Public Library, Museum, and National Gallery of Victoria, for 1895, with a statement of income and expenditure for the financial year 1894–5. Government Printer, Melbourne.

MCCOY, F. (1897): Schedule A. Donations to the National Museum during the Year 1896. Pp. 28–30 in: Report of the Trustees of the Public Library, Museums, and National Gallery of Victoria, for 1896, with a statement of income and expenditure for the financial year 1895–6. Government Printer, Melbourne.

MCCOY, F. (1898): Schedule A. Donations to the National Museum during the Year 1897. Pp. 32–35 in: Report of the Trustees of the Public Library, Museum, and National Gallery of Victoria, for 1897, with a statement of income and expenditure for the financial year 1896–7. Government Printer, Melbourne.

MITCHELL, F.J. (1948): A Revision of the Lacertilian Genus *Tympanocryptis*. Records of the South Australian Museum **9**: 57–86.

MOORE, G.F. (1884): Diary of Ten Years Eventful Life of an Early Settler in Western Australia and also A Descriptive Vocabulary of the Language of the Aborigines. M. Walbrook, London. xi + [1] + 423 + [1] pp.; xi + [3] + 119 + [1] pp.

MOORE, J.A. (1961): The frogs of eastern New South Wales. Bulletin of the American Museum of Natural History **121**: 149–386 + pl. 27–46.

MORTON, S.R. & MULVANEY, D.J. (1996): Exploring Central Australia. Society, the Environment and the 1894 Horn Expedition. Surrey Beatty & Sons, Chipping Norton. x + 398 pp.

MULVANEY, D.J. (1996): "A splendid lot of fellows": achievements and consequences of the Horn Expedi-

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tion. Pp. 3–12 in: MORTON, S.R. & MULVANEY, D.J. (eds.) Exploring Central Australia: Society, the Environment and the 1894 Horn Expedition:. Surrey Beatty & Sons, Chipping Norton.

MULVANEY, D.J. & CALABY, J.H. (1985): 'So Much That is New' Baldwin Spencer 1860–1929. A biography. University of Melbourne Press, Melbourne. 492 pp.

MULVANEY, D.J., MORPHY, H. & PETCH, A. (2001): 'My Dear Spencer' The letters of F.J. Gillen to Baldwin Spencer. Hyland House, Flemington. xvii + 554 pp., 24 pls.

MULVANEY, D.J., PETCH, A. & MORPHY, H. (2000): From the Frontier. Outback letters to Baldwin Spencer. Allen & Unwin, St Leonards. xiv + 338 pp.

MUSGRAVE, A. (1932): Bibliography of Australian entomology 1775–1930 with biographical notes on authors and collectors. Royal Zoological Society of New South Wales, Sydney. viii + 380 pp.

NIND, S. (1832): Description of the Natives of King George's Sound (Swan River Colony) and adjoining Country. Journal of the Royal Geographical Society of London **1**: 21–51.

PARKER, H.W. (1940): The Australasian frogs of the family Leptodactylidae. Novitates Zoologicae **42**: 1–106.

PARKER, T.J. & HASWELL, W.A. (1897): A Text-book of Zoology. 2 Vols. MacMillan & Co., London. [xl] + 839 + [1] pp.; xx + 728 pp.

PEAKE-JONES, K. (1985): The Elder Scientific Exploration Expedition, 1891: a study of incompatibles. Proceedings of the Royal Geographical Society of Australasia (South Australian Branch) **85**: 54–67.

PESCOTT, R.T.M. (1954): Collections of a Century. The History of the First Hundred Years of the National Museum of Victoria. National Museum of Victoria, Melbourne. frontispiece, x + 186 pp.

RAWLINSON, P.A. (1976): The endemic Australian lizard genus *Morethia* (Scincidae: Lygosominae) in southern Australia. Memoirs of the National Museum of Victoria **37**: 27–41.

ROBERTS, J.D. (1997): Geographic Variation in Calls of Males and Determination of Species Boundaries in Tetraploid Frogs of the Australian Genus *Neobatrachus* (Myobatrachidae). Australian Journal of Zoology **45**: 95–112.

SHEA, G.M. (1991): Revisionary notes on the genus *Delma* (Squamata: Pygopodidae) in South Australia and the Northern Territory. Records of the South Australian Museum **25**: 71–90.

SHEA, G.M. (1999): Waite's Blind Snakes (Squamata: Scolecophidia: Typhlopidae): Identification of Sources and Correction of Errors. Records of the Australian Museum **51**: 43–56.

SHINE, R. (1980): Ecology of Eastern Australian Whipsnakes of the Genus *Demansia*. Journal of Herpetology **14**: 381–389.

SHINE, R. (1981): Venomous Snakes in Cold Climates: Ecology of the Australian Genus *Drysdalia* (Serpentes: Elapidae). Copeia **1981**: 14–25.

SHINE, R. (1983): Arboreality in Snakes: Ecology of the Australian Elapid Genus *Hoplocephalus*. Copeia **1983**: 198–205.

SHINE, R. (1984): Reproductive Biology and Food Habits of the Australian Elapid Snakes of the Genus *Cryptophis*. Journal of Herpetology **18**: 33–39.

SHINE, R. (1987): Food Habits and Reproductive Biology of Australian Snakes of the Genus *Hemiaspis* (Elapidae). Journal of Herpetology **21**: 71–74.

SHINE, R. (1991): Strangers in a Strange Land: Ecology of the Australian Colubrid Snakes. Copeia **1991**: 120–131.

SMITH, B.J. (1981): Dendy, Arthur. Australian Dictionary of Biography **8**: 279–280.

SMITH, L.A. (1985): A Revision of the *Liasis childreni* species-group (Serpentes: Boidae). Records of the Western Australian Museum **12**: 257–276.

SPENCER, W.B. (1885a): On the fate of the Blastopore in *Rana temporaria*. Zoologische Anzeiger **8**: 97–98.

SPENCER, W.B. (1885b): Some Notes on the Early Development of *Rana temporaria*. (1) Fate of the blastopore; (2) Some points connected with the early development of the cranial nerves. Quarterly Journal of Microscopical Science (new series) **25** (supplement): 123–137.

SPENCER, W.B. (1886a): The parietal eye of *Hatteria*. Nature **34**: 33–35.

SPENCER, W.B. (1886b): Preliminary Communication on the Structure and Presence in *Sphenodon* and other Lizards of the Median Eye, described by von Graaf in *Anguis fragilis*. Proceedings of the Royal Society of London **40**: 559–565.

SPENCER, W.B. (1887): On the Presence and Structure of the Pineal Eye in Lacertilia. Quarterly Journal of Microscopical Science **27**: 165–238.

SPENCER, W.B. (1888): On the presence of a Pentastomum parasitic in the Lung of the Copper-head Snake (*Hoplocephalus superbus*). Proceedings of the Royal Society of Victoria (new series) **1**: 110–111.

SPENCER, W.B. (1891): Notes on some Victorian Land Planarians. Proceedings of the Royal Society of Victoria (new series) **3**: 84–92.

SPENCER, W.B. (1892): A trip to Queensland in search of *Ceratodus*. Victorian Naturalist **9**: 16–32.

SPENCER, W.B. (1893). The Anatomy of *Pentastomum teretiusculum* (Baird). Quarterly Journal of Microscopical Science (new series) **34**: 1–73.

SPENCER, [W.]B. (1896a): Through Larapinta Land. A narrative of the Horn Expedition to Central Australia. Pp. xiii–xviii + 1–136 in: SPENCER, [W.]B. (ed.) Report on the Work of the Horn Scientific Expedition to Central Australia. Part I. – Introduction, Narrative, Summary of Results, Supplement to Zoological Report, Map. Dulau & Co., London and Melville, Mullen & Slade, Melbourne.

SPENCER, [W.]B. (1896b): Summary of the Zoological, Botanical and Geological Results of the expedition. Pp. 137–199 in: SPENCER, [W.]B. (ed.) Report on the Work of the Horn Scientific Expedition to Central Australia. Part I. – Introduction, Narrative, Summary of Results, Supplement to Zoological Report, Map. Dulau & Co., London and Melville, Mullen & Slade, Melbourne.

SPENCER, [W.]B. (1896c): Amphibia. Pp. 152–175 in: SPENCER, [W.]B. (ed.) Report on the Work of the Horn Scientific Expedition to Central Australia. Part II. – Zoology. Dulau & Co., London and Melville, Mullen & Slade, Melbourne.

SPENCER, W.B. (1898): Der Bau der Lungen von *Ceratodus* und *Protopterus*. Denkschriften der Medicinisch-Naturwissenschaftlichen Gesellschaft zu Jena **4**: 51–58.

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SPENCER, [W.]B. (1901): Two new species of frogs from Victoria. Proceedings of the Royal Society of Victoria (new series) **13**: 175–178.

SPENCER, [W.]B. (1914): Native Tribes of the Northern Territory of Australia. MacMillan & Co., London. xx + 516 + [2] pp., 36 pls., 1 folding map.

SPENCER, W.B. (1927): Joseph James Fletcher. Proceedings of the Linnean Society of New South Wales **52**: xxxiii–xlii + pl.

SPENCER, [W.]B. (1928): Wanderings in Wild Australia. 2 Vols. MacMillan & Co., London. xxviii + 455 + [1] pp., 16 pls., 4 folding maps, 1 folding diagram; xiv + pp. 457-930 + [2] pp.

SPENCER, W.B., CAMPBELL, A.J. & CORNWALL, E.M. (1888): Narrative of the expedition. In: CAMPBELL, A.J. (ed.) Expedition to King Island, November, 1887. Victorian Naturalist **4**: 146–162.

SPENCER, [W.]B. & GILLEN, F.J. (1899): The Native Tribes of Central Australia. MacMillan & Co., London. xx + 671 pp., 9 pls.

SPENCER, [W.]B. & GILLEN, F.J. (1904): The Northern Tribes of Central Australia. MacMillan & Co., London. xxxv + 784 + [2] pp., 2 folding pls., 1 folding table, 1 folding map.

STERNFELD, R. (1919): Neue Schlangen und Echsen aus Zentralaustralien. Senckenbergiana **1**: 76–83.

STERNFELD, R. (1925): Beiträge zur Herpetologie Inner-Australiens. Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft **38**: 221–251.

STIRLING, E.C. & ZIETZ, A. (1893): Vertebrata. Transactions of the Royal Society of South Australia **16**: 154–176.

STORR, G.M. (1966): The *Amphibolurus reticulatus* species-group (Lacertilia, Agamidae) in Western Australia. Journal of the Royal Society of Western Australia **49**: 17–25.

STORR, G.M. (1968): Revision of the *Egernia whitii* species-group (Lacertilia, Scincidae). Journal of the Royal Society of Western Australia **51**: 51–62.

STORR, G.M. (1969): The genus *Ctenotus* (Lacertilia, Scincidae) in the Northern Territory. Journal of the Royal Society of Western Australia **52**: 97–108.

STORR, G.M. (1971): The genus *Ctenotus* (Lacertilia, Scincidae) in South Australia. Records of the South Australian Museum **16**: 1–15.

STORR, G.M. (1974a): Agamid lizards of the genera *Caimanops*, *Physignathus* and *Diporiphora* in Western Australia and Northern Territory. Records of the Western Australian Museum **3**: 121–146.

STORR, G.M. (1974b): Revision of the *Sphenomorphus richardsonii* species-group (Lacertilia, Scincidae). Records of the Western Australian Museum **3**: 66–70.

STORR, G.M. (1980): Ten new *Ctenotus* (Lacertilia: Scincidae) from Australia. Records of the Western Australian Museum **9**: 125–146.

STORR, G.M. (1988): The *Diplodactylus ciliaris* complex (Lacertilia: Gekkonidae) in Western Australia. Records of the Western Australian Museum **14**: 121–133.

STRAHAN, R. (1985): Opening remarks to the Australasian Herpetological Conference. Pp. iii–iv in: GRIGG, G., SHINE, R. & EHMANN, H. (eds.) Biology of Australasian Frogs and Reptiles. Surrey Beatty & Sons, Chipping Norton.

STREHLOW, C. (1907): Einige Sagen des Arandastammes in Zentral-Australien. Globus **92**: 123–126.

SWEET, G. (1897): On the variations in the spinal nerves of *Hyla aurea*. Proceedings of the Royal Society of Victoria (new series) **9**: 264–296 + tables A–N.

SWEET, G. (1908a): The Anatomy of Some Australian Amphibia. Part I. A. – The Openings of the Nephrostomes from the Coelom. B. – The Connection of the Vasa Efferentia with the Kidney. Proceedings of the Royal Society of Victoria (new series) **20**: 222–249.

SWEET, G. (1908b): Variations in the Anatomy of *Hyla aurea*. Proceedings of the Royal Society of Victoria (new series) **21**: 349–364 + pl. xix–xx.

SWEET, G. (1909): The Endoparasites of Australian Stock and Native Fauna. Proceedings of the Royal Society of Victoria (new series) **21**: 454–502.

THOMSON, D.F. (1933): Notes on the Australian snakes of the genera *Pseudechis* and *Oxyuranus*. Proceedings of the Zoological Society of London **1933**: 855–860.

THOMSON, D.F. (1934): A new snake from north Queensland. Proceedings of the Zoological Society of London **1934**: 529–531.

THOMSON, D.F. (1935): Preliminary notes on a collection of snakes from Cape York Peninsula. Proceedings of the Zoological Society of London **1935**: 723–731.

TUBB, J.A. (1938): The Sir Joseph Banks Islands. Reports of the expedition of the McCoy Society For Field Investigation and Research 11. Reptilia, Part 1: General. Proceedings of the Royal Society of Victoria **50**: 383–393.

WAITE, E.R. (1915): Mammalia and Ophidia. In: WHITE, S.A. et al. Scientific Notes on an Expedition into the North-Western Regions of South Australia. Transactions of the Royal Society of South Australia **39**: 735–739.

WAITE, E.R. (1917): Mammalia and Ophidia. In: WAITE, E.R. et al. Results of the South Australian Museum Expedition to Strzelecki and Cooper Creeks. September and October, 1916. Transactions of the Royal Society of South Australia **41**: 430–440.

WAITE, E.R. (1925): Field Notes on some Australian Reptiles and a Batrachian. Records of the South Australian Museum **3**: 17–32.

WAITE, E.R. (1927): The fauna of Kangaroo Island, South Australia. No. 3. – The reptiles and amphibians. Transactions of the Royal Society of South Australia **51**: 326–329.

WAITE, E.R. (1929): The reptiles and amphibians of South Australia. Government Printer, Adelaide. 270 pp.

WALSH, G.P. (1981): Fletcher, Joseph James. Australian Dictionary of Biography **8**: 525–526.

WALSH, G.P. (1983): Harrison, Launcelot. Australian Dictionary of Biography **9**: 217–218.

WEEKES, H.C. (1927): A note on reproductive phenomena in some lizards. Proceedings of the Linnean Society of New South Wales **52**: 25–32.

WEEKES, H.C. (1929): On placentation in reptiles. No. i. 1. *Denisonia superba* and *D. suta*; 2. *Lygosoma* (*Liolepisma*) *weekesae*. Proceedings of the Linnean Society of New South Wales **54**: 34–60.

WEEKES, H.C. (1930): On placentation in reptiles. II. Proceedings of the Linnean Society of New South Wales **55**: 550–576.

WEEKES, H.C. (1933): On the distribution, habitat, and reproductive habits of certain European and Australian snakes and lizards, with particular regard to their adop-

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tion of viviparity. Proceedings of the Linnean Society of New South Wales **58**: 270–274.

WEEKES, H.C. (1935): A Review of Placentation among Reptiles with particular regard to the Function and Evolution of the Placenta. Proceedings of the Zoological Society of London **1935**: 625–645.

WHITE, J. (1790): Journal of a Voyage to new South Wales with Sixty-five Plates of Non descript Animals, Birds, Lizards, Serpents, curious Cones of Trees and other Natural Productions. J. Debrett, Picadilly. [16] + 299 + [41] pp., 65 pls.

WHITLEY, G.P. (1970): Early history of Australian zoology. Royal Zoological Society of New South Wales, Sydney. [iv] + 75 pp.

WHITLEY, G.P. (1975): More early history of Australian zoology. Royal Zoological Society of New South Wales, Sydney. 92 pp.

WHITTELL, H.M. (1954): The literature of Australian birds: a history and a bibliography of Australian ornithology. Patterson Brokensha, Perth. frontispiece, xi + 116 + 788 pp., 31 pls.

WHITTELL, H.M. & CALABY, J.H. (1954): John Gilbert's notebook on marsupials. Western Australian Naturalist **4**: 104–114.

WINNECKE, C. (1897): Journal of the Horn Scientific Exploring Expedition, 1894, together with maps and plans; and Report of the Physical Geography of central Australia, by Professor R. Tate and J.A. Watt, B.Sc. Government Printer, Adelaide. frontispiece, 86 pp., 23 pls., 3 folding charts, 1 folding map.

WITTEN, G.J. (1994): Taxonomy of *Pogona* (Reptilia: Lacertilia: Agamidae). Memoirs of the Queensland Museum **37**: 329–343.

ZIETZ, F.R. (1914): Lacertilia. In: WHITE, S.A. et al. Scientific Notes on an Expedition into the Interior of Australia carried out by Capt. S.A. White, M.B.O.U., from July to October, 1913. Transactions of the Royal Society of South Australia **38**: 440–444.

ZIETZ, F.R. (1915): Lacertilia. In: WHITE, S.A. et al. Scientific Notes on an Expedition into the North-Western Regions of South Australia. Transactions of the Royal Society of South Australia **39**: 766–769.

ZIETZ, F.R. (1917): Lacertilia. In: WAITE, E.R. et al. Results of the South Australian Museum Expedition to Strzelecki and Cooper Creeks. September and October, 1916. Transactions of the Royal Society of South Australia **41**: 469–472.

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